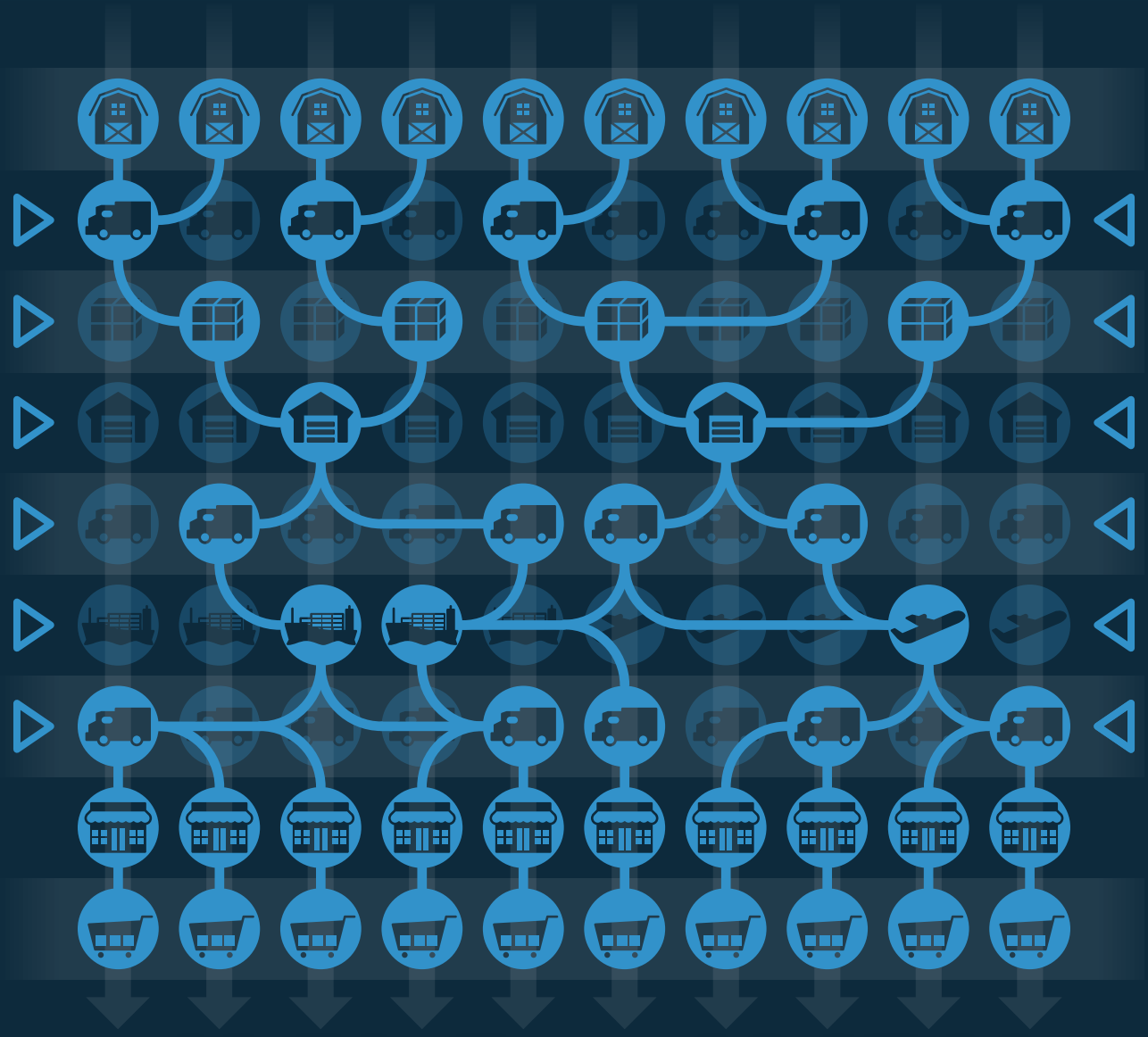

HORIZONTAL LOGISTICS COLLABORATION

CASES FROM AGRI-FOOD SUPPLY CHAINS IN MOROCCO

ISMAIL BADRAOUI

Propositions

1. Similarity of partners' products and processes is a crucial factor for a successful horizontal collaboration practice in agri-food supply chains (this thesis)

2. Collaborating partners' actions define their trustworthiness, and their trustworthiness determines the collaboration success (this thesis)

3. Combining empirical studies and operations research models is key to developing successful business strategies

4. In a time where science has become heavily dependent on technological advancements, we should be reminded that throughout history simple observations led to major scientific discoveries

5. Life barriers are only as insurmountable as one would perceive them to be

6. A high level of social capital is as unfavourable for the development of a community as a low level of it

Propositions belonging to the thesis, entitled:

"Horizontal Logistics Collaboration: Cases from Agri-Food Supply Chains in Morocco"

Ismail Badraoui

Wageningen, 19 June 2019

Horizontal Logistics Collaboration:

Cases from Agri-Food Supply Chains in Morocco

Ismail Badraoui

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This research was conducted under the auspices of the Wageningen School of Social Sciences (WASS)

Horizontal Logistics Collaboration:

Cases from Agri-Food Supply Chains in Morocco

Ismail Badraoui

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Prof. Dr A.P.J. Mol,
in the presence of the
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Contents

Chapter 1 - General Introduction

Current reports on the world's demographics indicate that the world's population is expected to reach 9.7 billion by 2050, with annual increments of around 80 million people (FAO, 2017). This perspective raises an important number of challenges relative to satisfying the growing population needs, especially when it comes to food security (Searchinger et al., 2014). Indeed, demand for food products is projected to increase by 50% in the period between 2012 and 2050 as a result of a larger, more urban, and richer population. This means that food production must increase to follow demand while relying on increasingly stressed natural resources (FAO, 2017). Achieving food security does not solely rely on increasing food production, but also on improving the population access to food products, both in terms of price and availability (FAO, 2017). This raises the need to efficiently manage the logistics activities involved in the production and distribution of food products by building a competitive logistics sector.

Building a competitive logistics sector represents a major challenge for most countries. Efficient logistics services stimulate internal economic development by facilitating the mobility of products. In contrast, inefficient logistics can result in considerable losses in terms of time and money (Mustra, 2011). In many countries, the growing consumers' wish for diversified products, reduced lead times, and better services increase the complexity of modern supply chains, for which a competitive logistics sector is essential to deliver the right value to the consumers. Moreover, countries and economic actors are becoming increasingly aware of the environmental impact of their logistics activities (e.g. CO2 emissions), adding an additional layer of complexity to modern supply chains (Soysal, 2015). These challenges require the adoption of innovative logistics strategies enabling companies to deal with the complexity of today's supply chains while aiming to reduce their environmental impact.

Current trends in Supply Chain Management emphasize the importance of collaborative relationships in addressing problems combining economic profitability and the impact on the environment (Speranza, 2018). Among the many collaborative strategies discussed to date, Horizontal Logistics Collaboration (HLC) has gained much attention in recent years (Basso et al., 2019), and had been praised for its potential benefits in terms of cost reduction and the decrease in CO2 emission (Soysal, 2015). HLC is defined as a collaboration between companies operating at the same supply chain level (Saenz et al., 2015). Nonetheless, successful HLC cases are rare due to several practical issues inherent to their implementation (Basso et al., 2019). In response to this paradox, this research draws on several economic and

behavioural theories and uses both case-based and survey-based methods in a complementary way to increase our understanding of which factors have an influence on the impact of HLC on the system performance, that is its potential benefit in terms of cost reduction and decrease in CO2 emission.

The research is conducted in the context of Agri-Food Supply Chains (AFSCs) in Morocco. The country choice is motivated by the fact that Morocco has recently emerged as a regional logistics hub because of its favourable geographical position and advanced status with the European Union (Oxford Business Group, 2018). But if the country wants to fully play its role of a regional hub, infrastructure needs to be developed and innovative logistics strategies need to be adopted to facilitate the consolidation and transit of goods (Gonnet et al., 2017). Focusing on Morocco also provides an opportunity to study collaboration the case of a developing country, which economic, demographic, institutional, and cultural characteristics differ from those of developed countries (Badraoui et al., 2019). The industry choice was motivated by the two elements. First, the important place occupied by the agri-food sectors in Morocco, which represents nearly 30% of the overall national industrial production and 38% of the total number of jobs in the country (Ministère de l'Economie et des Finances, 2010). Despite its importance, the agri-food industry suffers from a low growth rate, which is partially due to its fragmented distribution side (Boulaksil and Belkora, 2017) that results in higher costs along the chain. Second, considering collaboration in the agri-food sector also allows us to include additional elements proper to collaboration AFSCs, for which literature in still much limited (Dania et al., 2018).

In the next sections, we first start by discussing issues relative to the logistics and agri-food sectors in Morocco and how HLC can help improve the current situation, thus establishing the societal relevance of the subject. Afterwards, we dive into the academic relevance of HLC and identify research gaps that need to be tackled. Finally, we present the methodological design and the thesis outline.

1.1 Current inefficiencies of the transportation and logistics sector in Morocco

Our research interest started by observing the current inefficiencies of the transportation and logistics sector in Morocco. Accounting for 5% of the national GDP and weighing 100,000 direct jobs, the transportation and logistics sector represents an important, but fragile and

weakly organized sector (Van Wulpen, 2014). Despite being considered as a priority sector by the Moroccan government, which committed to invest in modern logistics infrastructure facilitating local, regional, and international flows, the performance of the logistics sector remains unsatisfactory. Indeed, Morocco occupies the 109th position according to the 2018 LPI report, with a mean rank of 82 over the last 6 years (Arvis et al., 2018). Its ranking per LPI component varies between the 93rd position for infrastructure and 115th for customs. Economy wise, the inefficiencies of the logistics sector can be measured through its impact on the GDP. In Morocco, logistics costs amount to 20% of the GDP (Agence Marocaine de Développement de la Logistique, 2016), which is 5% higher than the percentage of other emerging countries (e.g. Mexico).

The overall laborious state of the logistics sector can be observed at the level of the goods transportation sector. Its fragmented structure, characterized by the predominance of small and medium-size companies representing 95% of the operators, greatly limits its potential for development (Van Wulpen, 2014). Moreover, more than 90% of these companies are individuals owning 1 or 2 trucks (with an average truck age of 13 years), which does not guarantee quality transportation services. In addition to its internal limitations, the logistics sector must deal with increasingly competitive and demanding supply chains. Taking the example of Morocco's Agri-Food Supply Chains, illustrated in Figure 1.1, retailers require food companies to make frequent small quantity deliveries to a large number of stores in the country (Boulaksil et al., 2017). Food processors are also required to deliver each of the many retailers' stores separately, leading to distribution inefficiencies such as low truck utilization rates, and high transportation costs. In addition, the numerous small retailers (nano-stores), which represent the typical outlets for the consumers' daily needs in developing countries, make decisions randomly regarding their supply which further impacts the distribution efficiency (Boulaksil and Belkora, 2017).

Considering the aforesaid inefficiencies, innovative methods need to be put forward by public authorities and economic actors to overcome the currently faced difficulties.

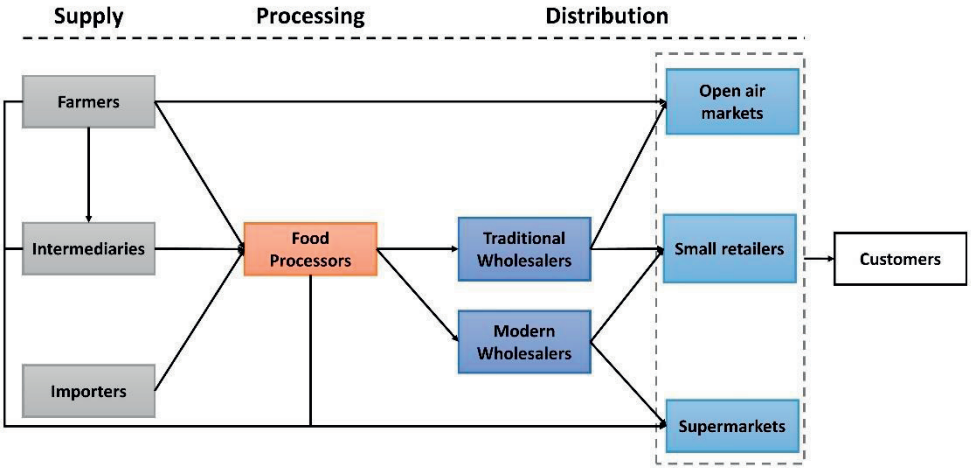

Figure 1.1: Illustration of the physical flows in agri-food supply chains in Morocco

1.2 A new strategy for the development of logistics competitiveness

Today, public authorities and the private sector actors are aware that logistics competitiveness represents an important lever for Morocco's development (Agence Marocaine de Développement de la Logistique, 2016). A competitive logistics sector also represents a pre-requisite for the success of other sectoral strategies, especially the strategy for the industrial emergence and the strategy for the development of the agri-food sector called "The Green Morocco Plan" (Van Wulpen, 2014). As such, a national strategy for the development of logistics competitiveness has been defined (Agence Marocaine de Développement de la Logistique, 2016), with the objective to:

- Reduce the portion of the logistics costs in the GDP from 20% to 15% on the mid-range;
- Increase the national GDP by 5% over 10 years through the added value induced by logistics costs reduction;
- Contribute to the sustainable development efforts of the country by reducing freight transportation CO2 emissions by 35%;

The new strategy for the logistics sector is based on five pillars, namely:

- Improving the logistics infrastructure by investing in regional logistics hubs;
- Encouraging flow consolidation through the new regional logistics hubs;
- Supporting the emergence of quality logistics service providers;

- Investing in education programs to train skilled logistics professionals;
- Improving the governance of the sector through public-private partnerships;

While the majority of the pillars represent macro activities consisting of public investments in different areas and aspects of logistics, the second pillar (i.e. encouraging flow consolidation) depends on the willingness of the private sector actors to work together and consolidate their shipments. Flow consolidation would, for instance, allow shippers to group frequent shipments and transport in full truckloads, thus reducing their transportation costs (Cruijssen, 2006). This practice is an example of the numerous collaboration activities covered by the concept of *Horizontal Logistics Collaboration (HLC)* (Basso et al., 2019). HLC refers to the situation where two or more firms, operating on the same supply chain level, collaborate on logistics activities to reach mutual goals (Saenz et al., 2015).

Many benefits can be achieved through HLC, both in terms of economic value and impact of the environment. On the economic side, HLC improves the productivity of the core activities, reduces supporting activity costs, and allows companies to service volumes infeasible for the individual organization (Cruijssen, 2007). It, therefore, contributes to cost reduction and order fulfilment rate improvement (Basso et al., 2019). On the environmental side, flow consolidation contributes to the reduction of the travelled distances by carriers, thus reducing the environmental impact of the transportation activity (Cruijssen, 2012, Soysal et al., 2018). HLC can go beyond simply sharing truckloads to reach joint procurement, warehousing, distribution planning, and production line sharing (Basso et al., 2019). Despite the potential benefits of HLC, this strategy represents an uncertain situation, with several operational and relational impediments inherent to close interfirm relationships. If HLC contributes to cost reduction, it also results in considerable setup, coordination, and control costs (Cruijssen, 2006). Furthermore, the difficulty to find adequate partners to collaborate with as well as the risks of behavioural hazards, such as opportunistic behaviour, increase the required control costs in the relationship. Therefore, HLC can only be perceived as beneficial if the generated benefits outweigh the incurred costs (Esper and Williams, 2003).

The above discussion shows that HLC may represent a suitable strategy to tackle some of the current inefficiencies of the logistics sector in Morocco and to reach the objectives set by the above-mentioned national logistics strategy, thus supporting its societal and practical relevance as a research topic.

1.3 Research opportunities

This introductory chapter provides, so far, points to the societal relevance of HLC as a strategy to face the current inefficiencies of the transportation and logistics sector in Morocco, as well as the challenges imposed by modern supply chains.

In addition to its societal relevance, the scientific community has recognized the importance of HLC in recent years. Although the literature on HLC remains relatively scarce compared to the literature on vertical collaboration (Martin et al., 2018), several authors examined horizontal logistics collaboration in transportation (Cruijssen, 2007, Verstrepen et al., 2009; Verdonck 2017; Yalimaz and Savasaneril, 2012), purchasing (Bakker et al., 2008; Schotanus et al., 2010; Walker et al., 2013; Muhewezi, 2010), warehousing (Reaidy et al., 2015), and manufacturing (Bahinipati et al., 2009; Monroy and Arto, 2010; Seok and Nof, 2014). These contributions have mainly focused on analysing horizontal collaboration enablers, resulting in two sets of factors. The first set includes factors that are similar to vertical collaboration enablers, such as information sharing, dedicated investment, joint relationship efforts, trust, and commitment. The second set includes factors specific to HLC, such as shared or geographically close customers or suppliers, the geographical proximity of the collaborating entities, and the partners' similarity. Despite the rich insights on HLC enablers gained through the above-mentioned contributions, successful real-world cases of HLC are still rare (Basso et al., 2019). As such, the literature on HLC points to a few areas where further research can be undertaken to increase our understanding of the elements that contribute to HLC success or failure.

First, according to Leitner et al. (2011), Raue and Wieland (2015), and Martin et al. (2018), the literature on horizontal collaboration lacks a general classification of different collaboration types and how to successfully manage these relationships. While several typologies of horizontal collaboration exist (e.g. Cruijssen et al., 2007; Moutaouakil et al., 2012; Pomponi et al., 2013), they only classify collaboration types according to different dimensions and do not provide sufficient information on the operational requirements of each type (e.g. the kind of assets and information to share, the processes to integrate, and the procedures to formalize). In addition, these typologies do not highlight which performance indicators allow the assessment of each collaboration type outcomes (i.e. the results obtained by the partners from collaborating in relation to its potential benefits in terms of cost

reduction and CO2 emission decrease). This raises the need to develop a practical classification of HLC and to provide companies with useful insights on the operational requirements and the performance indicators for each collaboration type.

Second, according to Saenz et al. (2015), a firm's industry and country contexts define which enablers and barriers influence collaborative attitudes. While research on horizontal collaboration does not provide empirical studies supporting this premise, the literature on vertical collaboration shows that context micro and macro factors can enable or hinder the development and implementation of collaboration (Matopoulos et al.,2007; Flynn et al., 2010; Van der Vaart et al., 2012; Rossi et al., 2013; Zhang and Cao, 2018). Nevertheless, empirical studies have only considered the case of manufacturing industries in developed countries (Hudnurkar et al., 2014), raising questions regarding the applicability of the findings to Agri-Food Supply Chains (AFSCs) and developing countries. On the one hand, AFSCs differ from regular supply chains with unique characteristics such as products specific transportation and storage requirements and limited shelf life (Van der Vorst et al., 2011). On the other hand, developing countries differ from developed countries in terms of political, economic, socio-cultural and demographic characteristics (Mersha, 1997). Therefore, a better understanding of the industry and country context effect on HLC enablers and barriers remains essential to increase its chances to succeed.

Third, compared to the collaboration enablers, little attention has been given to the identification of collaboration barriers (Basso et al., 2019). A barrier can be defined as an obstacle to establishing collaboration and promoting collaborative behaviour (Saenz et al., 2015). Prior research on vertical collaboration barriers highlights several barriers to collaboration such as the lack of trust and commitment between partners, the aversion to sharing information, the resistance to engage in collaborative efforts, and the complexity of the collaborative strategies coupled with the lack of collaborative skills (Walker et al., 2013, Fawcett et al., 2015). Nevertheless, the literature lacks contributions that link the collaboration resistors and enablers in a way that can lead to the creation of an integrative theory of collaboration (Fawcett et al., 2015). Connecting collaboration enablers and barriers is essential for firms to migrate from cycles of collaboration resistance to relational advantages. Given the current paradox between the overall enthusiasm regarding HLC and the mitigated number of successful cases, understanding which barriers interfere with the implementation of collaboration enablers is highly important.

In light of what has been discussed so far in this chapter, understanding the underlying dynamics of HLC is relevant both from a societal and a theoretical perspective. Accordingly, the overall objective of this thesis is defined as follows:

Overall Objective: to obtain insights in classifications of Horizontal Logistics Collaboration, and factors influencing its impact on performance in Agri-Food Supply Chains in Morocco.

Figure 1.2 provides an overview of our research framework. Following the presented research opportunities, four elements are presented as having an influence on the outcomes of an HLC concept, namely the collaboration type, the collaboration enablers and barriers, and the context under which the collaboration is undertaken. Each of the elements presented below is discussed separately in the subsequent chapters of the thesis and are integrated in Chapter 6, as explained in Section 1.5 below.

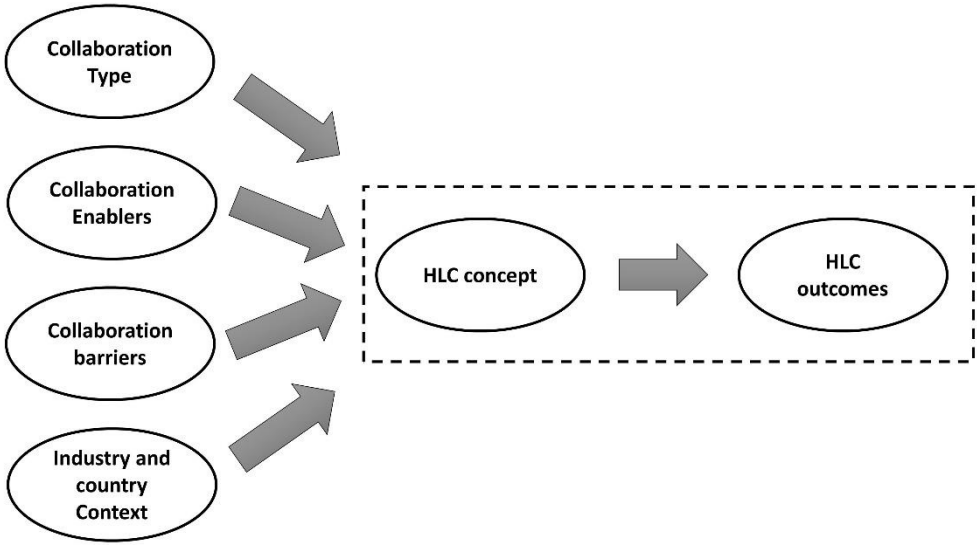

Figure 1.1: Research framework

1.4 Research objectives and methodological design

In line with this formulated overall objective, and following the research gaps presented in section 1.3, we have defined four research objectives which are introduced below, along with the methodological design:

RO1: Develop a typology of horizontal logistics collaboration

This first objective of this thesis is to develop a typology of Horizontal Logistics Collaboration, which in addition to the collaboration type, includes insights on (i) the HLC enablers and what their implications are on the logistics system, (ii) the context factors that have a potential influence on HLC, and finally (iii) the performance indicators allowing the assessment of the collaboration outcomes. We do so by first reviewing existing typologies of inter-firm collaboration, discussing their limitations and defining the dimensions for our typology. Second, contributions regarding collaboration enablers and context influence are discussed and matched with the components of HLC. Third, the literature on collaboration outcomes is discussed, including the development of key collaborative performance indicators. A case study from the agri-food sector is used to illustrate the applicability of the developed typology.

RO2a: Identify the factors influencing the outcomes of HLC in Agri-Food Supply Chains (AFSCs) in Morocco.

The second objective of the thesis is to identify the factors that have an influence on HLC outcomes in the context of AFSCs in Morocco. Considering that the literature on collaboration has mainly focused on the case of manufacturing industries in developed countries (see section 1.3), the applicability and completeness of the findings to AFSCs and developing countries need to be investigated. First, we adapt existing conceptual models for vertical collaboration to the case of HLC, while taking into consideration the specific characteristics of AFSCs. Second, we explore through case studies the factors influencing HLC in AFSCs in Morocco to account for country-specific factors. The aim is to develop a conceptual model for HLC in AFSCs in Morocco as an example of a developing country.

RO2b: Identify the effects of industry and country contexts on the factors influencing HLC outcomes.

The third objective of this research is to investigate the context influence on HLC by statistically testing the conceptual model developed in Chapter 3 for companies in developing and developed countries, as well as in- and outside the agri-food industry. First, we conduct an extended survey to collect data for the analysis. Second, we use structural equations modelling to examine similarities and differences between these different contexts by comparing the importance of operational and relational constructs. The aim is to understand

whether (industry and country) context has an influence on the relationship between the collaboration activities, the mediating relational constructs, and collaboration outcomes.

RO3: Examine the similarities and differences between industry professionals' expectations and actual opinion towards HLC (a) and identify which collaboration barriers limit collaborative behaviour (b).

The fourth objective of the thesis is to compare industry professionals' expectations for and feedback from HLC success factors and identify which barriers limit collaborative behaviour. First, based on the data collected for RO2b, we empirically compare collaborating and non-collaborating professionals' opinions with respect to the success factors of HLC using confirmatory factor analysis. Second, we examine the reasons behind the observed differences by conducting a Delphi study. The aim is to highlight the differences between professionals' intentions and behaviour and to understand which factors have a limiting effect on collaborative behaviour.

1.5 Thesis outline

The thesis starts with the development of a practical typology of Horizontal Logistics Collaboration in Chapter 2. In Chapter 3, we develop and investigate a conceptual model for HLC linking collaborative activities to collaboration outcomes, through the mediation of relational factors. In Chapter 4, we empirically test the conceptual model developed in Chapter 3 for companies in developing and developed countries, as well as in- and outside the agri-food industry. In chapter 5, we present a comparative study of industry professionals' intentions and behaviour and identify which collaboration barriers limit collaborative behaviour. In the last chapter (Chapter 6), we summarize and discuss the conclusions and main findings of the thesis. Managerial and theoretical implications of this research are also discussed, along with its limitations and directions for future research.

Chapter 2 - A Typology of Horizontal Logistics Collaboration Concepts

This chapter is based on:

Badraoui, I., van der Vorst, J.G.A.J, Boulaksil, Y. A Typology of Horizontal Logistics Collaboration Concepts: an illustrative case study from agri-food supply chains. *Submitted to an international scientific journal*

In this chapter, we investigate RO1:

To develop a typology of horizontal logistics collaboration

Abstract

In this chapter, we typify HLC Concepts (HLCCs), identify their operational implications, and link each HLCC to adequate performance indicators. We first discuss the currently available typologies and their limitations and define relevant collaboration classification dimensions. Then, a detailed analysis of each dimension is conducted, including the identification of resulting collaboration types. Next, collaboration enablers and the context influence are discussed, as well as their implications on the logistics system, with a specific focus on Agri-Food Supply Chains (AFSCs). Additionally, adequate KPIs are selected to evaluate collaboration outcomes. Finally, the HLCC is applied to an illustrative case study from AFSCs. The results show that HLC is a complex strategy where several elements intervene in the creation of the collaboration scenario. The research also shows that the specific characteristics of AFSCs influence the partners' selection process and increase the importance of partners' similarity and information exchange.

2.1 Introduction

Collaboration with partners in the supply chain has become essential in a world characterized by increasing global business, product diversification, pressure to reduce inventory, high transportation costs, and increasingly competitive markets. Collaboration in the supply chain is defined as a long-term inter-firm relationship with the objective is to increase the chain efficiency through closer vertical and horizontal relationships (Lehoux et al. 2014). While vertical collaboration refers to closer buyer-seller relationships, horizontal collaboration occurs when two or more firms operating at the same supply chain level decide to work together to reach mutual goals (Anand and Bahinipati 2012). Compared to vertical relationships, contributions on horizontal collaboration remain relatively scarce (Raue and Wieland 2015; Verdonck 2017), especially when it comes to defining different horizontal logistics collaboration types (Martin et al. 2018). Contributions on horizontal collaboration lack a general classification of different collaboration types as well as insights on how to successfully govern these relationships, i.e. enablers and barriers as well as implications in terms of the logistics system (Raue and Wieland, 2015; Martin et al., 2018). Therefore, it is important to define a higher-level construct which, in addition to the collaboration type, includes additional aspects relative to the collaboration implementation, namely the collaboration enablers and barriers, the contextual factors, the requirements in terms of the logistics system, and the adequate indicators for evaluating the collaboration outcomes. We refer to such a construct as a horizontal logistics collaboration concept (HLCC).

The instantiation of the four elements representing the HLCC is defined as a horizontal logistics collaboration (HLC) scenario. In general, a logistics scenario represents a way of working in the supply chain (Van der Vorst and Beulens 2002) and is described by four elements, namely the managed system, the managing system, the information system, and the organizational structure. From the perspective of HLC scenario, as a special case of the logistics scenario, the managed system refers to the collaborating partners, the required resources that they need to share, and the products they are handling. The managing system represents the collaborative processes ensuring joint planning and execution of the collaboration. The information system refers to the kind of information that should be exchanged between collaborating parties for better execution of the collaborative processes.

Finally, the organizational structure represents how the network is physically structured and how responsibilities are divided among the different parties.

Figure 2.1 represents our research framework, which brings together all the elements included in our definition of Horizontal Logistics Collaboration concepts. The HLC type refers to a distinguishable form of collaboration. The HLC enablers represent the different operational and relational factors that facilitate the implementation of horizontal logistics collaboration (Saenz et al. 2015). The context factors refer to permanent elements of the context in which HLC is undertaken, which have the potential to affect its performance (Kirezieva et al. 2013). Finally, collaboration outcomes represent specific indicators which allow the assessment of the collaboration experience, both at the operational and relational levels.

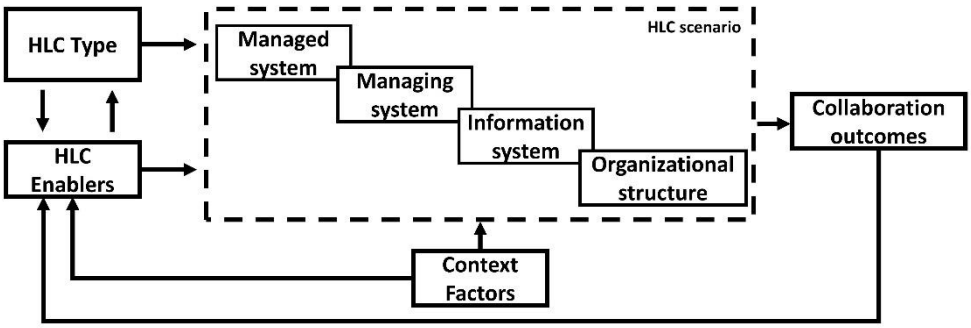

Figure 2.1: Horizontal Logistics Collaboration research framework (adapted from Vlajic et al., 2012)

Accounting for the existing contributions on horizontal collaboration, the objective of this chapter is to develop a comprehensive framework of horizontal logistics collaboration, through (i) developing a typology of HLC, (ii) identifying the HLC enablers and what their implications are on the logistics system, (iii) categorizing context factors that have a potential influence on HLC, and finally (iv) identifying adequate performance indicators to assess the collaboration outcomes. To do so, we first conduct a literature review on existing typologies of inter-firm collaboration, discuss their limitations, and define the dimensions for our typology. Second, contributions regarding collaboration enablers and contextual influence are discussed and matched with the HLC scenario components. Finally, key performance indicators are discussed in the context of collaborative relationships to generate potential collaborative key performance indicators.

This study aims to contribute to the body of knowledge on collaboration by providing firms with a comprehensive guide towards the implementation of HLC. More specifically, the research tackles key collaboration barriers presented by Fawcett et al. (2012) and Fawcett et al. (2015), which boil down to managers having very limited knowledge on how to implement and manage collaborative relationships.

This chapter is organized as follow. Section 2 discusses the currently available interfirm collaboration typologies and their limitations, defines the considered dimensions for our typology, and discusses each dimension and the associated collaboration types. Section 3 presents the collaboration enablers and barriers and their implication on the HLC scenario. Section 4 discusses the context effect on horizontal logistics collaboration, while section 5 presents key collaboration performance indicators. In section 6, an illustrative case study from the agri-food sector is presented, and an implementation framework is presented. Finally, this chapter closes with a discussion and direction for future research.

2.2. Typology of horizontal logistics collaboration

2.2.1 A review of collaboration typologies

In this section, we briefly outline related studies that typify supply chain collaboration. Relevant contributions are gathered using electronic databases such as ScienceDirect, Emerald, Wiley, Taylor and Francis, and Sage Journals. The search criteria used are 'interfirm relationships', 'horizontal cooperation', 'horizontal collaboration', 'horizontal alliances', *'supply chain collaboration', 'supply chain cooperation'* and *'strategic alliances'*, in combination with *'typology', 'taxonomy', 'types'* and *'categories'*. The ancestry approach, which stands for examining the reference list of the identified publication, was used to identify typologies which were not found by means of the used keywords. The search focused initially on articles published in the period 1997-2017, with an additional article published in 2018 later added to the list. The search resulted in 39 contributions regarding inter-firm relationships, but only 18 contributions (16 journal articles, 1 conference paper, and 1 PhD thesis) specifically discussed collaboration types, which are presented in Table 2.2. Figure 2.2 shows the steps followed in the review of existing interfirm relationships typologies.

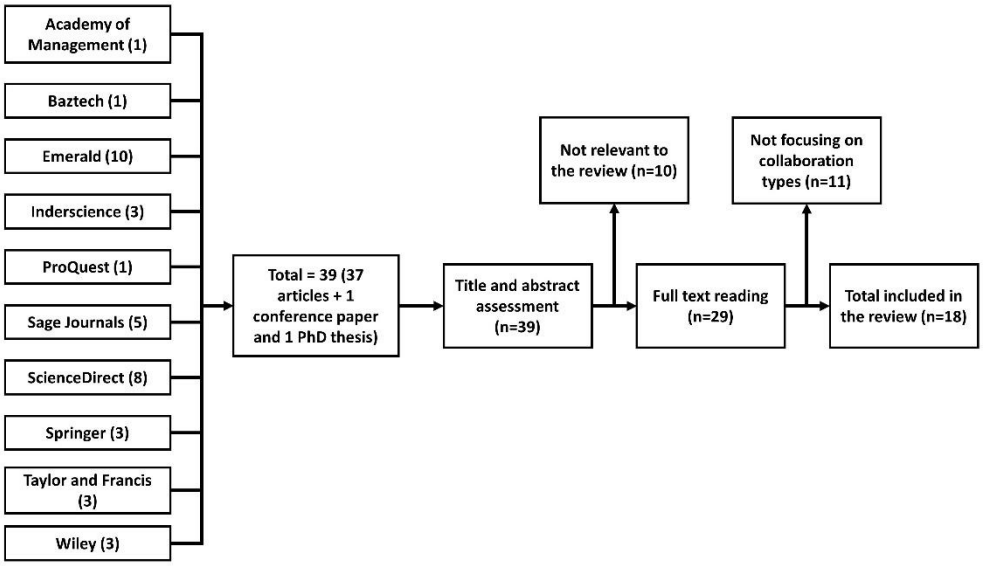

Figure 2.2: Interfirm collaboration typologies review methodology

Table 2.1 presents the journals from which the papers considered in this review were selected.

Table 2.1: reviewed articles distribution by journal

Journal	Number of articles
CIRP Journal of Manufacturing Science and Technology	1
Industrial Marketing Management	1
International Journal of Logistics Systems and Management	1
International Journal of Logistics Management	1
International Journal of Physical Distribution & Logistics Management	1
International Journal of Procurement Management	1
International Journal of Project Management	1
International Journal of Strategic Business Alliances	1
Journal of Business and Industrial Marketing	1
Journal of Business Logistics	2
Long Range Planning	1
Operations Management Research	1
Production Planning and Control	1
Research in Logistics and Production	1
Transportation Research Part E: Logistics and Transportation Review	1

The identified typologies used several dimensions to typify inter-firm collaboration, namely: nature, structure, integration level, scope, objectives, assets, intensity, the potential of flow consolidation, and collaboration activities. A *first group* of contributions typify collaboration according to the nature of the relationship of the collaborating firms, i.e. their position on the market (Bengtsson and Kock, 1999; Cruijssen, 2006; Verstrepen et al. 2009). In the spectrum separating coexistence and competition, cooperation can occur between competing and non-

competing firms. These two distinct situations are referred to as competitive and non-competitive collaboration.

A *second group* of studies examined interfirm collaboration based on the structure relationship, i.e., how that collaboration is managed (Cooper et al. 1997; Kampstra et al. 2006; Bakker et al. 2008). Although named differently, the authors present three collaboration types. The first type represents a dyadic relationship, which means that a direct relationship between the members is established by means of a joint team composed of employees from all the partners. The second type is referred to as channel integrator, which consists of a single member ensuring coordination between the different partners. The third type consists of a third-party organization that manages the collaboration on behalf of the partners.

A *third group* of studies typify collaboration practices based on the operations integration level (Lambert et al. 1999; Jagdev and Thoben 2001; Xu et al. 2005; Cruijssen et al. 2007; Kampstra et al. 2006, Martin et al. 2018). In between arm's length relationships and full integration, three main types of collaboration are identified, three types of vertical collaboration. The first type represents a short-term coordination setting involving a limited number of activities with companies remaining relatively independent. The second type involves cooperation on more activities and over a longer period, with companies integrating part of their business planning. The third type, which is commonly referred to as a strategic alliance, requires significant integration of operations and is materialized by a contractual agreement.

A *fourth group* of studies consider the collaboration intensity to typify collaboration (Zinn and Parasuraman 1997; Leitner et al. 2011). Intensity can be defined as the degree of involvement between the partners in executing day to day operations. Combined with the number of activities undertaken by the partners, collaboration can take different forms. Combined with a low number of activities, different intensity levels can result in limited or focused types of collaboration. When combined with a wide range of activities, extensive and integrated types of collaboration are observed.

A *fifth group* of typologies have used the collaboration scope to identify collaboration types (Zinn and Parasuraman, 1997; Cruijssen 2006; Pomponi et al. 2013, Verstrepen et al. 2009). When used independently from other dimensions, collaboration scope results in operational,

tactical, and strategic collaboration type. Operational collaboration is considered practical in nature and focuses on the joint execution of activities. Tactical collaboration involves midterm objectives and requires more planning and resources sharing. Strategic collaboration targets the companies' long-term objectives and forms the basis for tactical and operational activities.

A *sixth group* of typologies consider collaboration objectives and combined assets as potential dimensions (Cruijssen 2006; Verstrepen et al. 2009). According to both studies, different partnerships can be identified based on which tangible or intangible assets are shared (e.g freight, logistics facilities) or the explicit objectives of the collaboration (e.g. cost reduction, innovation, growth).

Finally, we identify some dimensions that were used by only one contribution to typify interfirm collaboration. Moutaoukil et al. (2012)'s review of supply chain pooling strategies led the authors to identify several horizontal collaboration concepts based on logistics activities, such as Collaborative Procurement Management (CPM), Collaborative Transportation Management (CTM) and collaborative warehousing (referred to as collaborative consolidation centres). Culpan (2009) investigate strategic alliances by considering the level of equity commitment from the partners.

Table 2.2: typologies of inter-firm collaboration

Reference	Article contribution
Cooper et al. (1997)	Typology of vertical collaboration based on collaboration structure
Zinn and Parasuraman (1997)	Typology of vertical collaboration based on collaboration scope and intensity
Bengtsson and Kock (1999)	Typology of horizontal collaboration in the lining industry based on the collaboration nature
Lambert et al. (1999)	Typology of vertical collaboration based on the integration level
Jagdev and Thoben (2001)	Typology of vertical collaboration based on the level of formalization
Xu et al. (2005)	Typology of vertical collaboration in the construction industry based on the integration level
Kampstra et al. (2006)	Typology of vertical collaboration based on the integration level and the collaboration structure
Cruijssen (2006)	Typology of horizontal collaboration among logistics service providers (LSPs) based on the collaboration nature, scope, objectives, and assets
Cruijssen et al. (2007)	Typology of horizontal collaboration among logistics service providers based on the integration level
Bakker et al. (2008)	Typology of horizontal collaboration in the health sector based on the collaboration structure
Culpan (2009)	Typology of strategic alliances based on equity commitment
Verstrepen et al. (2009)	Typology of horizontal collaboration LSPs based on collaboration scope, nature, combined assets, and objectives.

Table 2.2: typologies of inter-firm collaboration (Continued)

Reference	Article contribution
Leitner et al. (2011)	Typology of horizontal collaboration in the automotive industry based on collaboration intensity and flow consolidation
Schmoltzi and Wallenburg (2011)	Typology of horizontal collaboration based on the contract type, number of partners, activities, market coverage, services provided, and shared resources
Moutaoukil et al. (2012)	Typology of both vertical and horizontal collaboration based on the logistics activities
Pomponi et al. (2013)	Typology of horizontal collaboration based on the collaboration scope
Franco and Haase (2015)	Typology of alliances between small and medium-size firms based on the collaboration objectives and strategy ascertainment
Martin et al. (2018)	Typology of horizontal collaboration among LSPs based on collaboration scope and integration level

While the reviewed typologies offer a wide range of dimensions to typify collaborative experiences, they remain rather descriptive and need more discussion on the operational implications of each type. In other words, the reviewed typologies only classify collaboration types according to different parameters/dimensions and do not provide a complete description of each type in terms of its objectives, the kind of shared tangible and intangible assets, and performance indicators. This limitation is further confirmed by the absence of the '*logistics activities*' as a typology dimension. As suggested by Moutaoukil et al. (2012), collaboration can take place on different processes along the supply chain, which have different operational requirements in terms of the type of assets to share and the kind of information to exchange. Brekalo and Laers (2016) systematic review of HLC alliances points to the need for additional research discussing the operational mechanisms that help companies create successful horizontal collaboration relationships. As such, further discussion of the operational requirements of each type is needed to make the typologies practical.

2.2.2 A comprehensive typology for horizontal logistics collaboration

Attempting to develop a general typology including all the previously mentioned dimensions would result in a non-practical classification since the resulting types of inter-firm relationships increases as the number of considered classification criteria increases (Tong et al. 2008). The adopted approach to develop a comprehensive typology for HLC should follow the recommendation of the literature on typologies development. According to Bailey (1994), a typology should:

- Have mutually exclusive dimensions;
- Clearly distinguish the differences between the dimensions;

- Use classification dimensions which are well grounded in theory so that meaningful categories can be derived;
- Result in operationalizable classification;

While the dimensions developed in the previous studies cover a wide range of classification criteria, many of them are closely related, raising the need to eliminate redundancies. In this subsection, we analyse the current dimensions used to typify interfirm collaboration, eliminate redundancies, and suggest a set of mutually exclusive dimensions that result in operationally meaningful collaboration types. Following a configural approach, i.e. classification criteria as cross-matched to identify subgroups (Cannon and Perreault, 1999), the typology presented in Figure 2.4 results not in fixed HLC types but in varying types depending on the cross matched elements from each dimension.

As mentioned before, the dimensions used by the identified typologies present several redundancies. First, the intensity and integration level are highly similar, since they both refer to the degree of involvement of the partners in managing the collaboration. Second, collaboration scope and activities are also similar, since the first refers to the number of activities mutually undertaken by the partners. The potential of flow consolidation is also closely related to the collaboration activities since this latter increases as the collaboration scope gets broader. Finally, each collaboration type has specific objectives/aims and requires sharing specific tangible and intangible assets. Therefore, we consider that collaboration objectives and shared assets should be discussed within each collaboration concept rather than being considered as independent dimensions. Therefore, from the 9 dimensions discussed in previous collaboration typologies, we retain four dimensions for our typology: the collaboration intensity, the collaboration nature, the collaboration activities, and the collaboration structure. These four dimensions incorporate both the aspects brought up in the previously developed typologies and the identified gaps.

2.2.2.1 Collaboration intensity

Collaboration intensity refers to the "extent of direct involvement between partners, not only in establishing the alliance but also in performing, on a day-to-day basis, the logistics services embedded in it" (Zinn and Parasuraman 1997). In other words, intensity measures how much the partners interact with each other while forming and managing the collaboration. A high collaboration intensity could result in an integrated (broad scope) or focused (narrow scope)

collaboration, while a low-intensity collaboration results in an extensive (broad scope) or limited (narrow scope) collaboration.

Although intensive collaborations present the highest potential of cost reduction and service level improvement, they require high investments in dedicated assets and create more dependency between the partners, making them harder and more expensive to dissolves (Zinn and Parasuraman 1997). Intensive collaboration also requires high inter-organizational compatibility between partners in terms of internal (operational, tactical and strategic parameters) and external characteristics (industry orientation) (Bahinipati et al. 2009). Possible indicators of collaboration intensity include the size of shared assets (e.g. truckload, warehouse space…) and the work capacity invested in managing the collaboration (hiring new staff or dedicating existing employees) (Zinn and Parasuraman 1997; Cruijssen et al. 2007). Collaboration intensity can also be measured through the quantity, frequency, and quality of shared information (Vieira et al. 2009, Chen et al. 2011).

2.2.2.2 Collaboration nature

Based on the partners' position in the market, collaboration can be of different natures. In the spectrum separating coexistence from competition, collaboration can occur between competing and non-competing partners (Bengtsson and Kock 2000). A competitive collaboration will occur when the different participants operate in the same industry and are present in the same market segment, or if they offer a similar service to the same industry (i.e. present in the same supply chain). A non-competitive horizontal logistics collaboration occurs when companies, operating in different industries and/or different market segments (i.e. not present in of the same supply chain) collaborate on logistics activities (Cruijssen 2007). Collaboration can also take place between potential competitors, i.e. partners who are not yet on the same competitive market but share a high level of technological similarity (Song et al. 2015).

Because of conflicting individual interests, competitive collaboration is complex and might be more beneficial when competitors work together on non-core activities. Firms usually exhibit high concerns regarding their own know-how (Hung and Chang 2012), which results in limited knowledge and information sharing between competitors (Branstetter and Sakakibara 2002). Competitive collaborations can also result in high opportunity costs relative to technological leakages, management challenges, and other costs relative to

opportunistic behaviour (Oxley and Sampson 2004). Therefore, collaborating competitors are more likely to choose contractual agreements rather than tight relationship forms. Figure 2.3 shows the different collaboration types based on the partners' competitive state.

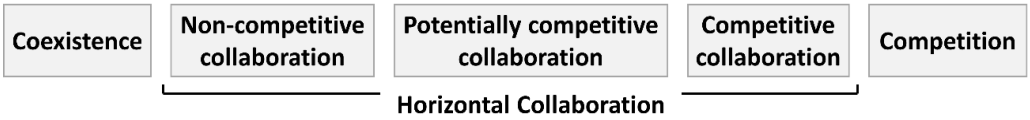

Figure 2.3: collaboration types based on the partners' position on the market

2.2.2.3 Collaboration structure

Collaboration structure refers to the way the interaction between collaborating partners is organized (Kampstra et al. 2006). The literature suggests various ways in which collaboration can be managed. The first possibility is the creation of a coordination unit composed of employees from all collaborating firms. This type has been referred to as a dyadic approach in vertical collaboration (Cooper et al. 1997), and as a virtual network in horizontal collaboration (Bakker et al. 2006). The second possibility is the designation of a channel integrator, i.e. one firm among the collaborating partners which is going to manage the collaboration and coordinate the activities (Kampstra et al. 2006). The choice of the channel integrator can be based on several criteria, such as connections to sales points or ownership of an asset used by the partners (e.g. companies collaborating on product distribution and using the trucks owned by one of the members). The third possibility is to call on an external entity (general contractor) to manage the collaboration and ensure synchronization of the activities. Such a possibility might be more adequate in case of competitive collaboration because of the high costs associated with information leakages.

It appears from the discussion above that the structure the collaboration takes is a combination between formality (formal vs informal) and closeness (tight vs loose). The adopted structure depends on different factors, such as the willingness to share information, the number of collaborating members, the size disparity between members and the shared assets (Bakker et al. 2006). The number of collaborating members sets a limit to what can be managed informally and what requires a formal structure (Nollet and Beaulieu 2003), while size disparity and assets sharing usually results in larger members taking the lead. The willingness to share Information influences whether collaborating members adopt loose or

tight collaboration structures. Figure 2.4 represents the three collaboration structures identified in the literature.

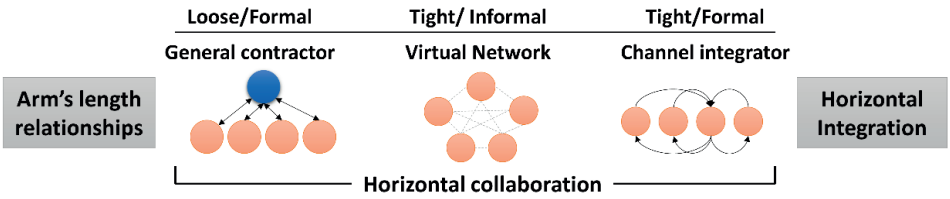

Figure 2.4: collaboration types based on the collaboration structure

2.2.2.4 Collaboration activities

Collaboration activities refer to the logistics activities on which companies decide to collaborate, such as procurement, transportation, warehousing, and manufacturing (Moutaoukil et al. 2012). Collaborative procurement (CP) (also referred to as cooperative purchasing, group purchasing, or consortium purchasing, refers to two or more firms collaborating on the procurement process, which entails different activities such as negotiation, contracting, and transportation (Bakker et al. 2008). CP increases the performance of the procurement process, as partners benefit from each other's knowledge and achieve economies of scale by consolidating purchasing orders (Essig 2000).

Collaborative transportation (CT) refers to sharing transportation information and capacity with partners, with the objective of reducing transportation cost and delivery time and improving delivery reliability (Tyan and Wang 2003). Benefits of CT can be measured both from shippers and carriers' perspective. Shippers register improvement on their on-time delivery rate, lead time, sales as a result of improved service to customers, and transportation cost. CTM also contributes to reducing inventory because of increasing delivery frequency (Cruijssen 2006). Carriers see their deadhead mile, dwell time and driver turnover lower, while fleet utilization rate gets higher Sutherland (2006).

Unlike CP and CT, collaborative warehousing (CW) has not been studied much in literature. It refers to the situation where "several producers and distribution companies share a physical space and logistics information to improve the global performance of the overall distribution processes" (Reaidy et al. 2015). The main objective of collaboration on warehousing is ensuring a higher utilization rate of storage spaces and facilitating load consolidation activities, thus representing an interesting complement to CT. Multiple shipper/carriers can

store and ship their products in collaborative warehouses, from which mutual transportation of products takes place. CW represents a challenging because of the heterogeneous types of products that are stored in the warehouse requiring different storage technologies (Roca-Riu and Estrada 2012).

Similarly to CW, Collaborative manufacturing (CM) has not attracted much attention in the literature, as manufacturers do not generally collaborate on core activities. Horizontal collaborative manufacturing consists of production capacity sharing (Seok and Nof 2014), collaborative product design (Bahinipati et al 2009) and collaborative production processes (Monroy and Arto 2010). Partners expect to reduce their costs through improved assets utilization and benefiting from knowledge sharing between the partners. However, several constraints arise from CM, such as reduced flexibility due to higher production quantities, high coordination costs, and the need for high similarity in the manufacturing processes of the partners.

2.2.2.5 Typology overview

We consider a collaboration type as the result of a combination of elements from the different dimensions that we have defined. Figure 2.5 recapitulates the different dimensions considered in our typology and their components. The decision regarding which element to choose from each dimension is not random but rather depends on the other dimensions of the typology. For example, a company can choose a low intensity or loose collaboration structure in a competitive collaboration to reduce the risk of information leakages. The choice of the collaboration type also depends on a set of collaboration operational and relational enablers, which are discussed in the subsequent sections.

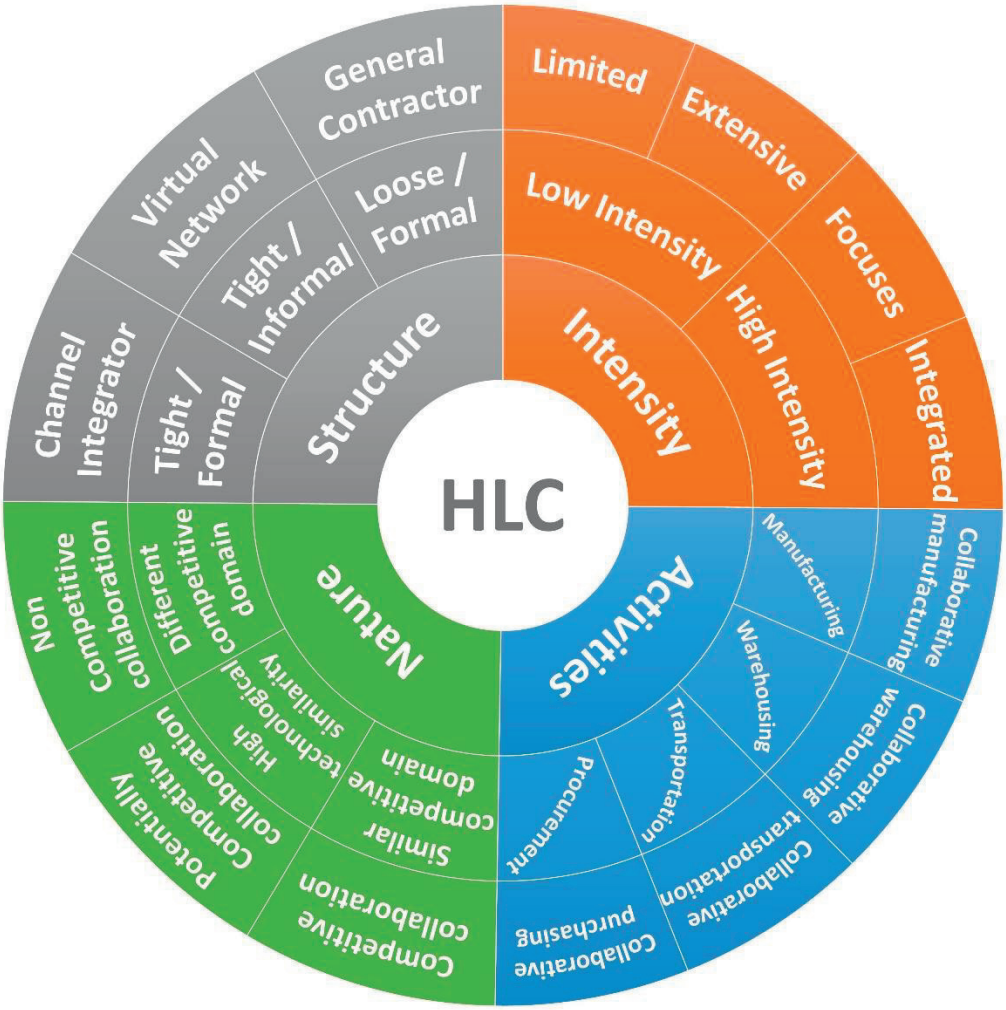

Figure 2.5: Typology of horizontal logistics collaboration

2.3. Collaboration enablers and their influence on the HLC scenario

2.3.1 Collaboration enablers

The literature on interfirm collaboration offers several contributions defining collaboration enablers. Theories such as Transaction Cost Theory (Williamson 1993), Social Exchange Theory (Blau 1964), and Extended Resource-Based Theory (Lavie 2006) are often used to identify and study the interactions between the different enablers as well as their influence on the collaboration outcomes. Economic-based theories (Transaction Cost) focus on the collaborative activities, such as information sharing, joint relationship efforts, and dedicated investments, as ways for companies to reduce opportunism and encourage cooperative

behaviour (Nyaga et al. 2010). Relational theories (Social Exchange) consider that moral hazards cannot be entirely contractually accounted for, leading to the development of relational governance mechanisms such as trust and commitment (Bensaou and Anderson 1999). Resource-based theories are based on the premise that competitive advantages span beyond the firm's internal assets and capacities, and that resource sharing allows firms to have access and benefit from each others' knowledge resources.

Although presented as three distinct sets of collaboration enablers, a strong relationship exists between the collaborative activities, including sharing resources, and the relational governance mechanisms. Investments specifically made for the benefits of the collaboration and sharing resources with partners signal positive intentions and the partners' engagement (Kwon and Suh 2004; Walker et al. 2013). As such, they are expected to positively impact the trust and commitment levels in the relationship. Sharing information, which has been identified as an essential element for accurate joint planning and execution of logistics activities, helps mitigate behavioural uncertainty contributes to building trust and commitment (Chen et al. 2011). Joint relationship efforts, which include setting up common goals, jointly planning and synchronizing decisions, and aligning incentive, are also expected to increase the trust and commitment levels in the collaboration as they represent tangible proof regarding partner's positive behaviour in the collaboration (Zhang and Cao 2018). Nevertheless, it remains important to note that the efficiency of joint relationship efforts depends on the degree of similarity between partners in terms of size (power balance), products, and processes (Schotanus et al. 2010; Pan, 2010).

While the collaborative activities represent the actions performed by the different partner, and as such are considered the pillars of the collaboration scenario, the relational enablers intervene at a higher level. Trust and commitment not only influence the partners' satisfaction with the relationship and the operational results (Nyaga et al., 2010), they also encourage collaborative behaviour (Schotanus et al. 2010) and interfere with the choice of the collaboration type. In the absence of trust, or elements building trust (e.g. prior interpersonal relationships), partners might start with a low-intensity collaboration, characterized by limited collaboration activities and loose collaboration structures. As relational enablers develop, it is expected that the partners become closer, thus increasing the collaboration intensity and moving towards closer management structures.

2.3.2 Horizontal logistics collaboration scenario

The diversity of contributions on horizontal collaboration offers different insights on the different factors influencing the collaboration outcomes. However, specific contributions translating these factors into operational decisions is still lacking. In this section, we discuss each component of the HLC scenario by turning each collaboration enabling factor into operational actions for collaborative procurement, transportation, warehousing, and manufacturing.

The managed system regroups three main components, namely assets and resources, collaboration network, and product characteristics. First, collaboration requires combining resources and/or investing in relationship-specific assets, such as purchasing stuff (Walker et al. 2013), collaborative transportation planning systems (Cruijssen 2006), collaborative production planning systems (Sherer 2003), and warehouse ambient systems (Reaidy et al. 2015). Second, collaborating members should be similar, not only in terms of size and negotiation power (Song et al. 2015), but also in terms of operational procedures/processes (Schotanus et al. 2010), geographical location (Cruijssen 2006), and products requirement (e.g. transportation and storage conditions) (Pan 2010).

The managing system represents the processes put in place to ensure joint planning and execution of the different activities on which the partners are collaborating, i.e. joint relationship efforts. Authors stress the importance of integrating processes and formalizing collaborative procedures, as well as defining a cost/benefits allocation mechanism (Vanovermeire et al. 2013; Schotanus et al. 2010). Formalized procedures are relative, for instance, to the supplier screening and selection process (Schotanus et al. 2010), transportation order sharing (Cruijssen 2006), data transfer process (McClellan 2002), and performance evaluation (Richards 2014).

The information system plays a vital role in collaboration and has been found to be one of the most important factors determining collaboration success (Fawcett et al., 2015). Depending on the logistics activity of which firms are collaborating, different kinds of information are expected to be shared. In CP, firms are expected to share information regarding the specifications of purchased items, purchasing plan, and their suppliers' performance (Walker et al., 2013). In CT, partners need to share information regarding upcoming transportation needs/orders, load tenders, available daily capacity, and shipments

status (Cruijssen 2006; Esper and Williams 2003). In CM, companies are expected to share information regarding products design, costs structure, and production planning (McClellan 2002). Finally, CW requires partners to share information regarding actual inventory state in the warehouse and the projected inventory levels based on planned receptions and expeditions.

The adequate organizational structure to adopt for in HLC depends on several factors, such as the number of collaborating firms, their homogeneity and geographical spread, and their process maturity (Bakker et al. 2006). In addition to these criteria, Cruijssen (2006) also discuss visibility on future conditions as decision criteria between formal and open contracts. Open contracts are best suited when future conditions can't be exhaustively captured in a formal agreement. Finally, Sherer (2003) and (Hingley et al. 2011) argue that collaborating through intermediaries facilitates the interaction between competing partners while ensuring information privacy.

Table 2.3 summarizes the operational implications of collaboration enablers on the different components of the HLC scenario. It is intended to be a checklist that walks firms through the operational building blocks of horizontal logistics collaboration. Because logistics activities have different characteristics/requirements, the results are presented for each collaboration activity separately. While some elements such as size similarity and cost/benefits allocation mechanisms remain similar, other elements differ from a logistics perspective, such as the kind of resources the partners need to combine of the type of information they need to share.

Table 2.3: Operational requirements for the HLC scenario by logistics activity

HLC scenario components	Sub-components	Enablers	Operational requirements			
			Collaborative procurement	**Collaborative transportation**	**Collaborative manufacturing**	**Collaborative warehousing**
Managed System	Assets and resources	Investment in relationship-specific assets	- Investing in collaboration coordination staff - Hiring new procurement staff for the collaboration;	- Investing in a collaborative transportation planning system	- Investing in a collaborative production planning system	- Investing in warehousing technologies such as RFID and ambient systems for real-time information sharing
		Combining resources	- Combining purchasing staff from the different collaborating parties;	- Sharing trucks and transportation capacity	- Sharing production capacity - Production resources should be complementary	Sharing storage capacity/facilities
	Collaboration network	Partners similarity	- Network member share similar or close purchasing procedures; - Network members are of similar size and have similar negotiation power;	- Network members are of similar size and have similar negotiation power; - Network members should be geographically close;	- Network members are similar (refer to Bahinipati et al. (2009)); - Network members should be geographically close;	Network members are of similar size and have similar negotiation power;
	Product characteristics	Product homogeneity	- Collaborating members purchase similar or close products	- Network members transport compatible products	- Manufactured products of each partner can be processed on the combined resources	Stored products belonging to different firms should be compatible
Managing system	Collaborative business processes	Integrated processes and formalized procedures	- Setting up a common group purchasing procedure; - Report on group performance periodically;	- Report on group performance periodically;	- Define a data transfer procedure; - Report on manufacturing performance periodically;	Develop joint scorecards and business plans
		Allocation of costs and benefits	Agree on a costs/savings allocation mechanism			
Information system	Information sharing	Knowledge exchange, information sharing, and communication	- Sharing Information and communicating on: - Specifications of purchased items; - Purchasing plan (quantity and period); - Suppliers performance;	Sharing Information and communicating on: - Transportation orders; - Levels of inventory; - sales and production schedules;	Sharing Information and communicating on: - products design; - costs structure; - production plans;	Sharing Information and communicating on: - Actual inventory state; - Projected inventory on hand;
Organization structure	Collaboration structure	Trust and partners similarity	The adequate structure of collaborative procurement depends on: - Number of collaborating members, size disparity between members, geographical spread, homogeneity of members, competitive nature of the collaboration, Clarity on future collaboration conditions			
	Studies		Bakker et al. (2008), Schotanus et al. (2010), Walker et al. (2013)	Esper and Williams (2003), Cruijssen (2006), Sutherland (2006), Pan (2010), Okdinawati et al (2015)	McClellan (2002), Sherer (2003), Garrette et al. (2009), Bahinipati et al. (2009)	Hingley et al. (2011), Richards (2014), Reaidy et al. (2015)

2.4. Context effect in horizontal logistics collaboration

The contingency approach to operations management practices is highly important, suggesting that the outcomes of a system depend on both its design as well as the environment in which it is operationalized (Kirezieva et al. 2013). Sousa and Voss (2008) define context variables as situational characteristics of a firm which are inherent to its environment and go beyond the firm's control. The literature on collaborative relationship highlights several relevant contextual, which can be classified into industry, country and organization characteristics.

Industry characteristics are relative to the physical and technological characteristics of the resource system and business climate. The physical and technological characteristics of the resource system represent both the products and the resources involved in the collaboration (Ostorm 2005). Products attributes refer to their physical, physiological and physio-chemical properties (Kirezieva et al. 2013), and define which products can be produced, stored, and transported together. The business climate refers to the characteristics of the sector or the supply chain in which the partners are operating. Supply chain characteristics, such as specific regulations, expensive technical equipment, and supply variability influence collaborative activities (Patel et al. 2012).

For instance, food supply chains rely on highly expensive and specialized technical equipment (Van der Vorst et al. 2011), which necessitate high capacity utilization to be profitable, thus increasing the importance of mutual investments and resource sharing. Additionally, food supply chains are characterized by specific conditions under which products must be produced, transported, and stored. As such, partners' similarity and product homogeneity become crucial factors defining collaboration success. Moreover, food supply chains are subject to strict regulations regarding treatability (Akkerman et al. 2010), increasing the need for complete information sharing regarding products origin.

Country characteristics represent institutional and community attributes as well as environmental attributes. Institutional attributes refer to formal and informal rules/regulation governing the resource system, which can be as specific as the laws regulating a specific sector (Edwards and Steins 1999). Formal rules include policies regarding various aspects such as merchandise transportation, conflict resolution, food safety norms. Informal rules

refer to local norms and cultural characteristics defining accepted/prohibited actions and behaviour (Mattor and Cheng 2015). Environment attributes represent the operational conditions in which the partners are operating, including but not limited to the country's infrastructure, its institutions' strength, and its economic situation (Patel et al. 2012). Country characteristics can influence collaborative activities in several ways. First, cultural norms can have a direct influence on the trust level between partner, as it's the case in developing countries where trust is limited outside family structures (Abbad et al. 2013). Other characteristics such as uncertainty avoidance and long terms orientation can also hinder collaborative activities in countries where people tend to avoid uncertain situations and do not foresee long terms returns (Zhang and Cao 2018). Finally, a weak institutional context was also found to negatively impact trust as firms fear the absence of conflict resolution mechanisms (Fuglsang and Jagd 2015).

Finally, organization characteristics represent the firms' internal configuration in terms of department, tasks, processes, and skills, which may impact the collaboration effectiveness (Patel et al. 2012). Several organizational characteristics have been identified as collaboration impediments, such as the leadership deficit and lack of collaborative skills, which negatively impact the partners' ability to engage in joint relationships efforts (Fawcett et al. 2015). The incompatible information systems and the organization collaborative culture were also identified as organizational characteristics limiting the information sharing between the partners (Zhang and Cao 2018).

2.5. Collaboration outcomes and performance indicators

The main objective a firm engaging in HLC is to improve its performance. As such, the relationship must generate sufficient value to create satisfaction among partners, which is necessary to compensate for the risky and time-consuming nature of collaboration (Johnston et al. 2004). Satisfaction, which stands for a positive evaluation of the collaboration experience, can be measured in terms of operational improvements and the quality of the relationship (Geyskens et al. 1999). Satisfaction with the relationship reflects the quality of the interaction between the partners and can be measured based on their level of commitment, involvement in joint efforts, and level of participation in joint decisions making. While the elements of satisfaction with the relationship remain the same in different collaboration

scenarios, satisfaction with the results is measured differently from a logistics activity to the other.

In aggregate terms, the operational improvements can be grouped into 5 categories, namely: cost, growth, responsiveness, innovation, and environmental impact (Cruijssen 2006). However, specific KPIs differ based on the logistics activity on which companies are collaborating and are typically based on the potential improvements expected from the collaboration. In collaborative procurement, partners expect to reduce their purchasing cost as a result of aggregate orders (Muhwezi 2010). Through knowledge sharing regarding their suppliers' performance, partners also expect improvements in terms of the number of active suppliers, quality of supplied items, the on-time delivery rate of suppliers, and the procurement cycle time (Kumar et al. 2005). In collaborative transportation, collaborating firms expect to increase their efficiency and reduce their costs, which can be measured in terms of cost per ton, cost per cubic foot, or cost per weight over distance, and then compared to historical performance levels (Esper and Williams 2003). In addition, collaborative transportation is expected to improve assets utilization through mutual use of transportation infrastructure (Cruijssen 2006), which could be measured through the number of empty backhauls, dwell time, and the total number of empty miles. Concerning collaborative warehousing, partners expect to increase the utilization rate of their storage capacity, which can be evaluated through the warehouse capacity utilization rate over a specific period (Wang et al. 2010). Mutual use of storage space will also result in an increased workload, which requires keeping a close eye on at the warehouse operation efficiency in terms of receiving time, put away time, and order pick up and preparation time (Staud et al. 2015), and order preparation accuracy (Rimiene 2008). Finally, collaborative manufacturing allows partners to increase their manufacturing capacity utilization through consolidating production orders from different firms, thus reducing idle time and manufacturing fixed costs (McClellan 2002). However, mutual use of production capacity might result in increasing number of setup changeovers, which results in production capacity losses and may eventually lead to increasing numbers of scraps (Jonsson and Lesshammar 1999) and machines break down frequency (Liao and Chen 2004).

Considering the discussion in sections 2 to 5, Figure 2.6 presents an enhanced view of the Horizontal Logistics Collaboration Concept based on the literature.

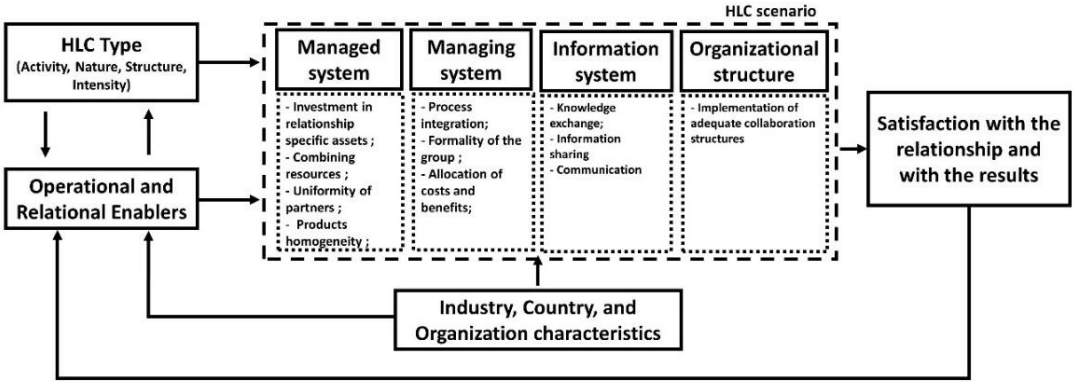

Figure 2.6: enhanced view of the Horizontal Logistics Collaboration Concept

2.6. An illustrative case study from the agri-food sector

2.6.1 Methodology

The case study followed the five-stage case research process presented by Stuart et al. (2002), with the first stage consisting of defining the objective of the case. In the case of this chapter, the objective is to use the case as an illustrative example for the HLCC. The second stage consists of developing a measurement instrument to collect data. An interview protocol was developed containing thirteen semi-close ended questions relative to the collaboration set up, operationalisation, and outcomes. The third stage of the process represents the data gathering phase. Four semi-structured interviews were conducted, each one lasting approximately 2 hours. This allowed the interviewees to cover in details different aspects of the collaboration and enabled us to cross match the interviewees' answers for triangulation purposes. The fourth stage of the process, relative to data analysis, was conducted using qualitative content analysis (Creswell 2014). Content analysis consists of transcribing raw data, condensing the original text, reducing the data into preliminary categories, refining the categories, and analysing the results. The results analysis followed the concept mapping method, consisting of graphically representing the different concepts and relationships in the case study (Schilling, 2006). Finally, results were sent back to the interviewees for final confirmation of the findings before dissemination.

2.6.2 Case overview and positioning in the typology

The illustrative case study presents collaboration experience which started in 2012 between two companies, referred to as Firm1 and Firm2, operating respectively in the agri-food sector

in Morocco and Turkey. Firm1 is the leading juice producer in Morocco with a market share of 19%, while Firm2 is a large Turkish manufacturer and exporter of biscuits, present in over 80 countries. Due to liquids low weight to volume ratio, Firm1 faced low truck utilization rates, with an average of 80% in terms of weight for only 40% in terms of volume. Trucks capacity utilization was also subject to seasonality in Juice consumption which drops by nearly 50% in winter. As such, Firm 1 objective was to improve its trucks capacity utilization through collaborative transportation.

The identification of potential partner(s) was based on several key elements. First, the partner had to operate in the agri-food sector to comply with the country's food safety regulations. Second, the partner had to manage products with an inverse weight to volume ratio, and with an inverse seasonality of demand compared to juice. Third, the partner had to manage compatible products with juice in terms of their transportation and storage conditions. Finally, the partners had to manage products with highly similar distribution channels. Firm1 opted for a collaboration with Firm2 because biscuits represented the most compatible products with juice, thus resulting in a non-competitive collaboration.

Because Firm1 was in possession of the assets used in the collaboration and had established relationships with a high number of sales points in the country, it acted as a channel integrator. This collaboration structure was also mandatory to comply with Morocco's trade regulation, imposing on foreign companies to have a local official representative if they wish to distribute their products in the country. Operationally, retailer orders in terms of juice and biscuits are expressed to Firm1, which then communicates the order to Firm2. Upon reception of the merchandise, both juice and biscuits are stored in Firm1 warehouses and then distributed by Firm1 fleet.

Concerning the intensity of the collaboration, the relationship started as a limited collaboration due to the absence of prior personal/professional relationships establishing trust. Based on the positive results from the first year both at the operational and relational levels, the volume of operations increased by 100%, which required more frequent meetings, exchanging precise and comprehensive information and establishing standardized collaboration procedures. During the third year, the relationship evolved into an integrated collaboration, with both firms reaching their desired objectives from the collaboration.

Based on the discussion above, the presented collaboration can be typified as non-competitive collaboration on the transportation and storage activities, managed by a channel integrator. The intensity of the collaboration changed over time, starting with a limited collaboration before moving to an integrated one.

2.6.3 Application of the HLCC

2.6.3.1 Collaboration setup and implementation

The process through which Firm 1 oriented the collaboration objective and started looking for potential partners puts the light on the relationship between the collaboration enablers, the collaboration type, and the context influence. The initial evaluation of the firm's performance revealed weak points relative to its transportation capacity utilization, which could be improved through collaborative transportation. The firm's assessment also defined the need to partner with firms offering non-similar but complementary products, ruling out the possibility of collaborating with a competitor and opening the door for smooth execution of the operational enablers, specifically process integration and information sharing. The decision to collaborate on the transportation activity also defined the operational requirements in terms of the collaboration implementation, which are presented in Table 2.3.

Regarding the influence of the collaboration enablers on the collaboration type, the absence of already established relational governance mechanisms, i.e. trust, acted as a limiting factor on the collaboration intensity. The relationship started with a low-intensity collaboration, which gradually increased as the partners developed a better idea about each other's intentions and became satisfied with their behaviour. Additionally, the fact that Firm 2 was going to share Firm 1 resources (fleet and warehouse space) and take advantage of its already well-established distribution network, qualified Firm 1 to act as a channel integrator in the collaboration.

Concerning the context influence at this level, the case reveals how both country and industry characteristics shaped the collaboration structure, the choice of the potential partners, and the collaboration operational activities. In terms structure, and given the absence of an official representative of the Turkish company in Morocco, Firm 1 had to take the role of a channel integrator in order to comply with the country's regulations. Regarding partners selection, the food safety regulations and the specific requirements of food products (e.g. temperature and humidity levels) (Van der Vorst et al. 2007) forced Firm 1 to choose a partner from the

agri-food sector with compatible products in terms of transportation and storage conditions. Concerning the operational activities, the fact that the partners were managing perishable food products increased the importance of jointly planning biscuits manufacturing and supply, which required a frequent exchange of exhaustive information captured by Firm 1 regarding sales patterns, inventory on hand, and available products shelf life.

Table 2.3: Case study collaboration scenario

HLC scenario components	Sub-component	Implementation of the collaboration scenario
Managed System	Assets and resources sharing	Firm 1 shared its transportation fleet and warehouse space with Firm 2
	Dedicated investments	No investments were identified in the case
	Collaboration network	Both partners are food processors and are similar in size
	Product characteristics	The partners' products are complementary in terms of demand pattern and weight to volume ration; The partners' products require similar transportation and storage capacity and are sold through similar distribution channels
Managing system	Collaborative business processes	The demand for juice and biscuits has been centralized at the level of the channel integrator (Firm 1), who consolidates orders before shipment
	Allocation of costs and benefits	The partners have agreed on a cost/benefits allocation mechanism in which Firm 1 pays Firm 2 for its biscuits, and then retains the margins once the biscuits are sold. To compensate for the risk of unsold biscuits, Firm 2 finances 60% of the marketing costs of Firm 1.
Information system	Information sharing	The partners shared information relative to: - Actual and projected Sales/demand; - Inventory levels and products shelf life; - Promotional activities;
Organization structure	Collaboration structure	The collaboration was entirely managed by Firm 1, who took the responsibility of consolidating orders from retailers and distributing products.

2.6.3.2 Continuous evaluation

The case study allowed us to identify the dynamic nature of collaboration, which is characterized by the feedback loop linking the collaboration outcomes to the collaboration enablers. In this case, and based on the positive evaluation of the collaboration results by the partner, both in terms of the quality of the relationship and the operational results, the partners developed more trust towards each other and a greater commitment to the relationship. This situation had a positive impact on the collaboration intensity, i.e. volume of operation, which doubled during the collaboration second year (from 4 to 8 containers of biscuits per month). The third year followed the same pattern, with the volume of operations reaching 12 biscuits containers a month. This scenario allowed Firm 1 to reach its objective in terms of trucks fill

rate and enabled Firm 2 to increase its annual turnover by approximately 5%. The continuous evaluation process has also allowed the partners to reflect on the operational challenges resulting from their highly intensive collaboration. Indeed, managing over 66 different SKUs, which differ in terms of demand pattern, shelf life, and order lead time, proved to be difficult to handle for both parties. As such, the intensity of the collaboration was brought down to manageable levels, with the partners focusing on profitable products. Figure 2.7 presents a complete picture of HLCC, including the findings from the case study.

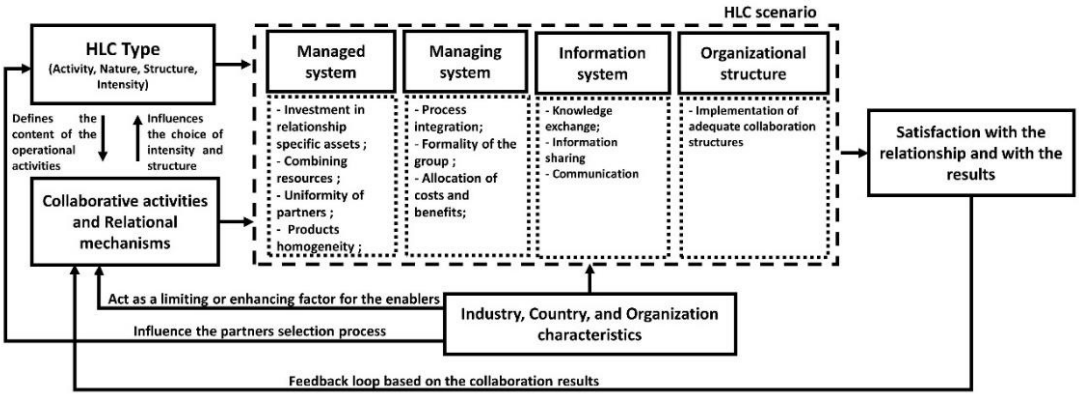

Figure 2.7: A comprehensive picture of the Horizontal Logistics Collaboration Concept

2.7. Discussion and future research

Considering today's highly competitive market conditions, firms are increasingly considering horizontal collaboration relationship to achieve a sustainable competitive advantage (Nyaga et al., 2010). However, many of these collaboration experiences do not live up to the expectations (Basso et al. 2019), with several socio-structural resistors impeding collaborative behaviour (Fawcett et al. 2015). In this regard, this chapter introduces a comprehensive view on horizontal logistics collaboration concepts (HLCC), which includes the collaboration types, the collaboration enablers and context implications on the HLC scenario, as well as the performance indicators allowing for a proper assessment of collaboration outcomes.

The contribution of this chapter is threefold. First, based on identified weaknesses of existing inter-firm collaboration typologies, we present a classification of horizontal logistics collaboration types based on the collaboration nature, intensity, structure, and the logistics activities subject to the collaboration. Second, we discuss the most recurrent collaboration

enablers and the role of contextual factors in defining the HLC scenario, and we identify collaborative performance indicators allowing to assess the collaboration outcomes. Third, the HLCC is applied in an illustrative case study from the Agri-food supply chains. The results show that the specific characteristics of agri-food supply chains influence decisions relative to partners selection and increase the importance of operational enablers such as partners similarity, information exchange, and resource sharing.

The application of the HLCC framework can be presented as a series of interrelated decisions, influenced by the firms' objectives as well as the collaboration enablers and barriers and its context. First, firms decide about the logistics activities they want to collaborate on. This decision is motivated by the firms' desire to improve their performance on one or several logistics activities. Second, companies identify their potential partners, considering both operational and relational enablers as well as the industry and country characteristics. Third, companies choose the collaboration structure to adopt, which is based on the nature of the collaboration, the assets ownership, trust, the willingness to freely exchange information, while also accounting for contextual elements (e.g. trade laws and regulations). The last decision concerns the amount of information and resources partners share in the relationship, i.e. the intensity of the collaboration. This decision depends not only on the nature of the relationship between the partners but also on the level of trust between them and on the collaboration results. In this regard, the collaboration intensity is seen as a dynamic dimension which increases or decreases based on the collaboration performance.
The limitations of the research conducted in this chapter are that the presented theoretical framework is primarily based on the literature and is illustrated through a single case study. Further in-depth case studies should be conducted to develop a better understanding of the collaboration dynamics and identify which elements lead to a successful implementation of collaborative relationships.

Chapter 3 - Horizontal Logistics Collaboration: An Exploratory Study in Morocco's Agri-Food Supply Chains

This chapter is based on:

Badraoui, I., van der Vorst, J.G.A.J, Boulaksil, Y (2019). Horizontal Logistics Collaboration: an exploratory study in Morocco's agri-food supply chains. *International Journal of Logistics Research and Applications, DOI: 10.1080/13675567.2019.1604646*

In this chapter, we investigate RO2a:

To identify the different factors influencing the outcomes of horizontal logistics collaboration in AFSCs in Morocco.

Abstract

Horizontal logistics collaboration (HLC) practices have gained much attention in recent years as ways for companies to improve their performance. However, little is known about which factors influence the success or failure of HLC, especially in agri-food supply chains (AFSCs) in developing countries. Therefore, this paper aims to investigate HLC in the context of AFSCs in Morocco as a case of a developing country. First, a literature review is conducted to develop a conceptual model for HLC considering typical AFSCs characteristics. Then, case studies are conducted in Morocco to refine the conceptual model based on insights from real collaboration experiences. The results show that collaboration outcomes are influenced by operational collaborative activities through the mediation of relational elements. The operational collaborative activities are impacted by AFSCs' characteristics, such as products specific handling conditions. Furthermore, the research shows that country cultural characteristics influence the development of trust in the relationship.

3.1 Introduction

Organizations continuously search for innovative ways to improve performance and gain a competitive advantage. In this regard, horizontal logistics collaboration (HLC) initiatives, such as collaborative transportation (Cruijssen, 2006), collaborative procurement (Schotanus et al. 2010), and collaborative consolidation centres (Reaidy et al., 2015), have gained much attention in the recent years. Nevertheless, despite the demonstrated benefits of collaborative practices, many firms struggle in their implementation and fail to reach the desired objectives (Nyaga et al., 2010). To date, collaboration has proven to be a difficult strategy to implement, mainly because key enabling and constraining factors are usually overlooked (Parsa et al., 2017).

Factors influencing collaboration are not only overlooked by collaborators but are also sensitive to the collaboration context (Zhang and Cao, 2018). According to Saenz et al. (2015), adopting a "one-size fits all" approach to collaboration may not lead to the best outcomes, as collaboration enabling and constraining factors have different influences in different contexts. Research conducted by Matopoulos et al. (2007) and Rossi et al. (2013) shows that context micro and macro factors can enable or hinder the development and implementation of collaboration, while Flynn et al. (2010) and Van der Vaart et al. (2012) conclude that the performance of collaborative practices differs under various contexts. This raises the need for firms to better understand collaboration enabling and constraining factors in their own context to achieve the maximum benefits (Sousa and Voss, 2008).

The literature offers several empirical studies, conducted in different industries, aiming at understanding which factors influence collaboration (Hudnurkar et al., 2014). While the variety of considered industries provides ground for a generalization of the results, AFSCs unique characteristics, such as specific transportation and storage requirements and limited shelf life (Van der Vorst et al., 2011), make it more necessary to investigate collaboration enabling and constraining factors in this sector. According to Dania et al. (2018), the interplay between the collaboration factors and their impact on the collaboration outcomes may be affected by the AFSCs characteristics. AFSCs also differ from other supply chains in the sense that, in addition to cost reduction, responsiveness, and sustainability, they also focus on food quality improvement and food waste reduction (Soysal et al, 2012). Also, existing empirical studies have only considered the case of developed countries (Hudnurkar et al.,

2014), raising questions regarding the applicability of the findings to developing countries which differ in terms of political, economic, socio-cultural, and demographic characteristics (Mersha, 1997).

This chapter has two main objectives. First, the research contributes to the body of knowledge by identifying factors influencing HLC. This is done by adapting an existing model for vertical collaboration to the case of horizontal collaboration and by taking into consideration the specific characteristics of AFSCs. Second, the research aims to explore, through in-depth case studies, the factors influencing HLC in AFSCs in Morocco. Morocco, as a study context, was chosen because of its political, economic, and socio-cultural similarities with its neighbouring countries, making the generalization of the findings to at least the North African countries possible. The choice of Morocco is also motivated by the country's commitment to improving the logistics sector by promoting flow massification through HLC (AMDL, 2016). As such, the number of HLC experiences is expected to increase, which urges the identification of collaboration success factors in Morocco. In this regard, our research is relevant both from a theoretical and a practical perspective.

The rest of the chapter is structured as follows. Section 3.2 discusses the theoretical foundations of this study, where scientific contributions relative to horizontal collaboration enablers and barriers are reviewed and propositions are formulated. In section 3.3, the methodology and findings from the case studies are presented and discussed based on the formulated propositions. In section 3.4, we discuss the case study results. Finally, in section 3.5, we conclude the chapter with a discussion of the research implications as well as its limitations.

3.2 Conceptual model and its propositions

The literature on HLC enablers and barriers offers many contributions investigating which factors facilitate the development and implementation of horizontal collaboration (e.g. Cruijssen, 2006; Muhwezi, 2010; Schotanus et al. 2010; Walker et al., 2013, Saenz et al. 2015). These factors can be grouped into operational enablers (information sharing, dedicated investments, incentives alignment, performance measurement, partners' compatibility; costs and benefits allocation), and relational enablers (trust, commitment, reciprocity, dependence). Nevertheless, the available contributions mostly focus on identifying which factors influence the collaboration success, without empirically investigating the relational

dynamics between these factors (Pomponi et al., 2015) and their impact on the collaboration outcomes.

Empirical research investigating the relationship between collaboration enabling and constraining factors and their impact on collaboration outcomes is mainly found in the literature on vertical relationships (e.g. Kwon and Suh, 2004; Kwon and Suh 2005; Cai et al., 2010; Chen et al., 2011, Nyaga et al., 2010; Cao and Zhang, 2011). Although different in nature, horizontal and vertical collaboration share some practical issues relative to the necessity to exchange information and jointly plan activities to reach the collaboration objectives (Basso et al., 2019). As such, this chapter builds on the accumulated knowledge of these vertical collaboration models in combination with the literature on horizontal collaboration to derive a conceptual model for HLC. More specifically, this chapter builds on the conceptual model developed by (Nyaga et al., 2010), which examines how collaboration outcomes are affected by (operational) collaboration activities through the mediation of relational elements. The choice of this model represents a good starting point since it combines both operational activities relative to the day-to-day execution of operations and relational mechanisms relative to the partner's willingness to collaborate in determining the collaboration outcomes. It also includes the most referred to factors impacting collaborating in the literature, namely dedicated investments, information sharing, joint relationship efforts, trust, and commitment. Moreover, the model allows capturing two different aspects of the collaboration outcomes, namely the partners' satisfaction with the relationship and with the results. Finally, the contribution has been widely cited and often used as a reference point to investigate supply chain collaboration. Other possible models which have been review for this purpose (Kwon and Suh, 2004; Fynes et al., 2005; Cai et al., 2010; Cao and Zhang, 2011; Chen et al., 2011) either focus on the antecedents of trust and commitment without considering the collaboration outcomes, or study the direct impact of collaboration on firms performance without pointing out the mediating or moderating role on the relational constructs. We first update the model by Nyaga et al. (2010) with elements from HLC literature and specific AFSCs characteristics and then add the specific contextual factors of Morocco identified through the case studies.

Figure 3.1 illustrates our conceptual model where the full arrows represent the relationships we investigate through the case studies. On the operational level, *partners' similarity* and *sharing resources* have been identified as additional factors based on the literature on

horizontal collaboration and AFSCs identifies. On the relational level, *dependence* originating from relationship-specific investments was identified as having an influence on the members' level of *commitment*. The combination of collaborative activities and the relational factors represents a part of the HLC scenario, which we defined in Chapter 2 as an internally consistent view of a possible instance of horizontal collaboration. The decisions made at the level of the HLC scenario result in the scenario's operational performance, which impacts the partner's satisfaction with the results. The dotted boxes represent additional constructs from the HLC and AFSC literature. We will now discuss each of the elements of the model in more detail.

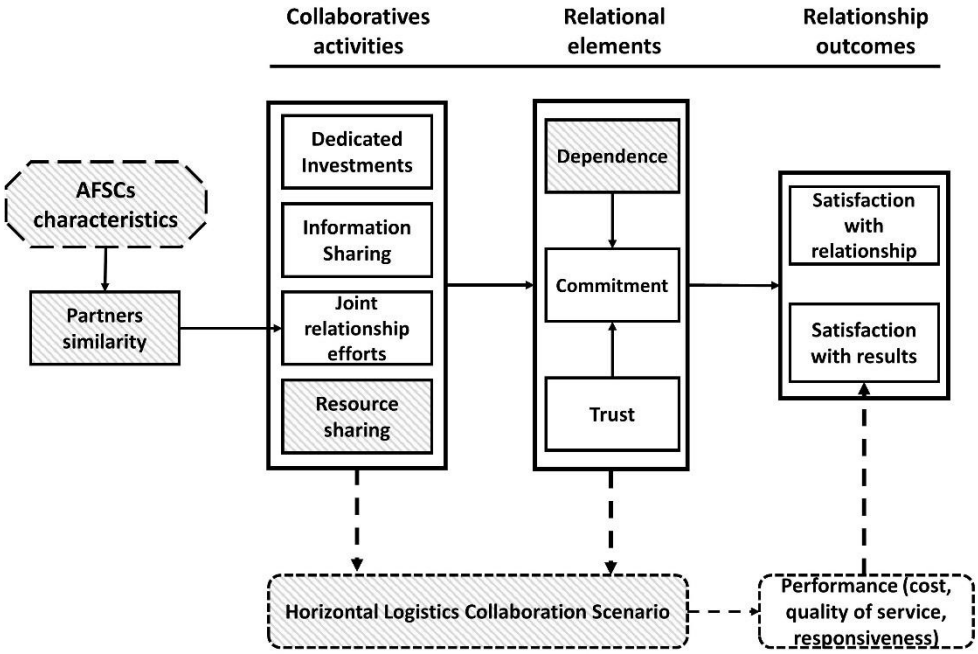

Figure 3.1: Horizontal logistics collaboration conceptual model

3.2.1 Collaborative activities

Collaborative activities represent actions that are performed by the different partners to prevent opportunism, encourage cooperative behaviour, and increase relational rents (Srinivasan and Brush, 2006). They are considered as interweaving elements influencing the collaboration outcomes (Zhang and Cao, 2018), which include relationship dedicated investments, sharing information, and joint relationship efforts (Nyaga et al., 2010).

3.2.1.1 Dedicated investments

Dedicated investments represent investments specifically made to reach the collaboration objectives (Cao and Zhang, 2011), and are essential to capture collaborative benefits such as higher returns and competitive advantage (Whipple and Russell, 2007). Investing in relationship-specific assets has been identified in vertical collaboration as having a positive impact on the trust partners exhibit towards each other, which leads to a greater commitment (Kwon and Suh, 2004). Horizontal collaboration literature also highlights the importance of dedicated investments in promoting trust and commitment (Walker et al., 2013). It provides evidence of the partners' engagement and creates a dependence on the relationship to capture a return on the investments (Cruijssen, 2006). Walker et al. (2013) add that, besides investing in new assets, sharing existing complementary resources in HLC offer evidence that the partners care for the relationship and are willing to make sacrifices through sharing their own assets. Therefore, the following propositions are formulated:

P1. *Investing in relationship-specific assets enhances trust and commitment in the relationship by providing evidence of the partner's engagement and generating a dependence between the partners.*

P2. *Sharing complementary resources enhances trust and commitment by providing evidence of the partner's engagement in the relationship.*

3.2.1.2 Information sharing

Information sharing refers to the exchange of relevant information between the collaborating parties to plan and control supply chain operations (Simatupang and Sridharan, 2005). It is defined by (Cao and Zhang, 2011) as '*the act of timely sharing relevant, accurate, complete, and confidential information with the partners*'. Information exchange plays a key role in collaborative actions, contributing to the reduction of information asymmetries and transaction risks (Chen et al., 2011). The literature on information sharing emphasizes its importance in achieving collaboration benefits. Kwon and Suh (2005) state that information sharing improves the trust level between the partners by contributing to the reduction of behavioural uncertainty. Chen et al. (2011) argue that information sharing is essential for trust-building, as it allows partners to understand each other's processes, accurately plan collaborative activities, and develop conflict resolution mechanisms. Information sharing in HLC ensures synchronization of collaborative activities and helps avoid opportunity costs

relative to sub-optimization (Cruijssen, 2006). It is important to note that efficient information sharing requires the implementation of e-collaboration tools, which success depend on technological, organizational and inter-organizational, and environmental contexts (Chan et al., 2012). Based on the discussion above, the following proposition is formulated:

P3. *Information sharing increases the trust and commitment in the relationship by allowing partners to better understand each other processes and jointly plan collaboration activities.*

3.2.1.3 Joint relationship efforts

Research has also shown that the collaboration success relies on the partners' joint efforts in planning and executing collaborative activities (Nyaga et al., 2010), which includes setting up common goals, decision synchronization and joint planning, and joint performance measurement (Min et al., 2005). First, setting up common goals has been put forward by (Cao and Zhang, 2011) as a performance improvement lever, consisting of switching from individual sub-optimizations to overall collaborative goals. Second, decision synchronization and joint planning, which stands for developing mutual plans and synchronizing operations, has also been identified as an important parameter contributing to collaboration success (Ramanathan and Gunasekaran, 2014). Third, the joint measurement of performance has become a standard for collaboration, as it diminishes misunderstandings and helps to identify problems before they become constraining (Fawcett et al.,2008). By allowing partners to co-align their operations and jointly plan the collaboration activities, joint relationship efforts are expected to enhance trust and commitment. Additionally, the literature on joint relationship efforts in HLC identifies incentives alignment as a key component improving trust and commitment (Walker et al., 2013; Schotanus et al., 2010). Given that a firm's decision to enter a collaboration is always of a selfish nature, incentives should be aligned between the partners if they are to cooperate (Cruijssen, 2006). It is important to note that companies only submit to joint relationship efforts as the power balance dictates (Benton and Maloni, 2005). Firms with strong negotiation power have little or reason to withhold exercising such power in seeking their own interest. As such, size similarity plays a key role in balancing the power in the relationship and ensuring all partners are committed (Schotanus and Telgen, 2007). This discussion leads to the following proposition:

P4. *Joint relationship efforts improve the partners' trust and commitment in the relationship through ensuring (i) the presence of common goals, (ii) the joint planning and execution of collaboration activities, (iii) the set-up of a performance measurement system, (iv) and the alignment of incentives.*

3.2.1.4 Additional insights from the literature on horizontal collaboration

Horizontal logistics collaboration literature puts the light on additional operational enablers relative to partners' similarity, which includes processes and products. Because HLC implies that partners complement each other through mutually undertaking logistics activities, process and product similarity become highly relevant (Cruijssen, 2006). Process similarity is not only expected to improve joint planning and execution of activities by reducing the need to adapt, but it also reduces the risk that partners develop different perceptions about the value each one brings to the relationship, thus contributing in the trust development (Schotanus et al., 2010). Product similarity, in terms of production, storage, and transportation requirements, also facilitates joint planning execution of logistics activities and reduces the need for companies to adjust to its partner's products' requirements (Pan, 2010). The following proposition has been formulated regarding partners' similarity:

P5. *Partners' size, product and process similarity is expected to facilitate joint relationship efforts.*

3.2.2 Relational elements

Discussing collaboration operational enablers has shed the light on several relational constructs originating from the Social Exchange Theory, which focuses on norms of reciprocity, i.e. what members receive versus what they give (Blau, 1964). Given that moral hazards cannot be identified in advance, firms are unable to account for all the uncertainty in the relationship through a contractual agreement, which encourages the development of relational governance mechanisms (Bensaou and Anderson, 1999) such as trust and commitment.

In the literature on vertical collaborations, trust is the most referred to collaboration enabler (Cruijssen, 2006). It refers to the extent to which a firm believes that its partners have the intention and motives to fulfil their obligations (Nyaga et al., 2010). It is considered as a relational governance mechanism that promotes non-enforced willingness to collaborate,

meaning that the partners perceive the benefits of the relationship (Schotanus et al., 2010). Empirical studies have shown a strong relationship between trust and sustained vertical relationships (Kwon and Suh, 2004; Nyaga et al., 2011; Fynes et al., 2005), which in principle reflects satisfaction with the collaboration. Trusting partners are also expected to show more commitment to the relationship, as they feel more confident to make the necessary efforts for the collaboration to succeed. Commitment occurs when the group members believe that the relationship is so important that it is worth making sure it endures (Morgan and Hunt, 1994). It is believed to have a direct influence on the collaboration results, as relationship improvements are reached when partners are committed to it (Krause et al., 2007). Finally, dependence, which occurs when an organization finds itself obliged to maintain a relationship with another organization to achieve the desired goals, increases the partners' commitment to the relationship (Geyskens et al., 1996). As such, the following propositions are formulated:

P6. Dependence enhances the partners' commitment to the relationship;

P7. Trust enhances the partners' commitment in the relationship through the belief that each member will fulfil their obligations;

P8. Trust improves the outcomes of collaboration through promoting non-enforced willingness to collaborate;

P9. Commitment improves the outcomes of collaboration through the belief that it is so important that it is worth making sure it endures;

3.2.3 Relationship outcomes

Collaboration must generate value to its members that is perceived as sufficient to remain engaged in a risky and time-consuming relationship (Johnston et al., 2004). In other words, not only should the obtained gains outweigh the costs (Esper and Williams, 2003), the collaboration should also generate a feeling of satisfaction among its members (Field and Meile, 2008). Satisfaction is defined as a positive evaluation of a firm's experience in collaborating with another firm (Dwyer et al., 1987), and can be measured in terms of the economic results and the relational aspects of the relationship (Geyskens et al., 1999). Satisfaction with economic results is based on the operational improvements resulting from taking part in the collaboration, which is critical as it influences the firm's willingness to commit to the relationship (Prahinski and Benton, 2004). Satisfaction with the relationship is

related to psychosocial aspects relative to the quality of the interaction between the partners, such as respect and willingness to exchange ideas.

In contrast with the model presented by (Nyaga et al., 2010), we decided to leave *performance* out of the relationship outcomes while keeping its relationship with the *satisfaction with the results*. This decision is motivated by the fact that we consider satisfaction, both with the relationship and the results, as higher-level constructs reflecting the partners' overall evaluation of their collaboration **(Dwyer et al., 1987)**. Performance remains an operational and directly measurable variable which interpretation differs from a firm to another depending on their expectations (Geyskens et al., 1999). For example, a 5% decrease in cost may be appreciated by one partner while resulting in poor satisfaction for the other partner(s). Thus, evaluating collaboration based on a measure of appreciation provides more valuable insights than on its absolute outcomes.

3.2.4 Implications from agri-food supply chains

To understand HLC in the context of the agri-food sector, it is important to analyse AFSCs specific characteristics and identify how they influence collaboration driving forces. AFSCs represent a set of activities allowing the production and distribution of food products in a "farm-to-fork" sequence **(**Tsolakis et al., 2014**)**. According to Van der Vorst et al. (2011), the unique aspects of food products give AFSCs specific characteristics differentiating them from other supply chains, such as:

- Short life cycle products;
- High volumes and high product variety;
- Long production throughput times and seasonality in farm production;
- Variability of quality and quantity of supplied products and processing yields;
- Specific requirements in transportation and storage conditions;
- Expensive technical equipment focusing on capacity utilization;
- Need to comply with national and international regulations relative to food safety and environmental issues;
- Need for traceability due to product safety responsibility

The distinctive characteristics of AFSCs influence the way partners interact with each other, raising concerns regarding products compatibility. Different products require different

conditions to deliver the right quality to the consumers (Van der Vorst et al., 2007), thus defining what products can be transported or stored together. Food products are also living organisms that constantly interact with the surrounding environment (Van der Vorst *et al*., 2007), which emphasize the importance of product compatibility. Partners' process and product compatibility become even more important in light of rigorous food safety regulations. Legislation targeting all stages in AFSCs define under which conditions food product should be produced, processed, and distributed (Akkerman et al., 2010). These constraints add an additional level of complexity to HLC, as product compatibility is not only relative to the products characteristics and interference risks, but also to legal sanitary and traceability obligations.

AFSCs are also known to rely on expensive specialized technical equipment (e.g. refrigerated trucks), for which high capacity utilization is necessary **(**Van der Vorst et al., 2011). This characteristic, combined with the seasonal pattern of food products, represents a major challenge for AFSCs. Through adequate resources sharing and specific investments, HLC is expected to improve the capacity utilization of the specialized equipment (Vanovermeire et al., 2013), provided products and processes similarities are ensured. Considering the discussion above, the following proposition is formulated:

P10. Partners similarity is a crucial factor for the success of Horizontal Logistics Collaboration in AFSCs ;

While the majority of the propositions hold for both vertical and horizontal collaboration and are derived from the model of (Nyaga et al, 2010), propositions 2, 5 and 10 are newly developed to account for the specific case of horizontal collaboration and the characteristics of AFSCS. Figure 3.2 shows the conceptual model used in this research including the formulated propositions.

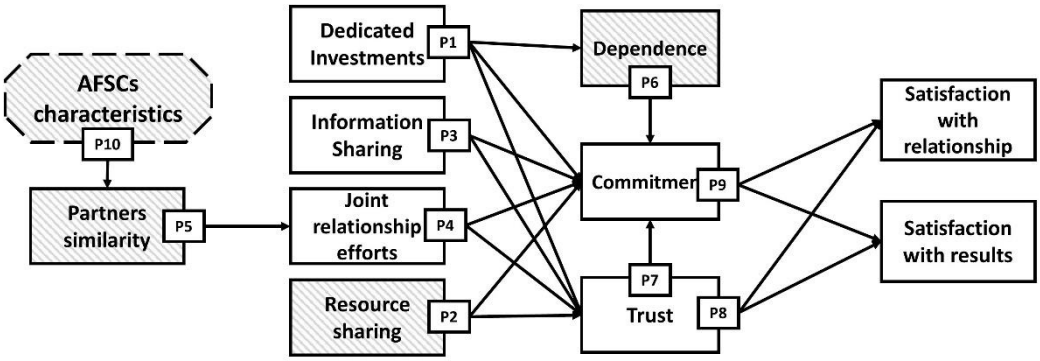

Figure 3.2: Conceptual model along with the propositions

3.3 Case studies from the agri-food sector in Morocco

3.3.1 Methodology

To understand how the identified collaboration enablers influence the design and operationalization of HLC in the context of AFSCs in Morocco, two exploratory case studies were conducted. Using case studies as a research method was preferred since it allows a more descriptive and exploratory approach that provides insights into the researched phenomenon (Voss et al., 2002). It also provides richness and first-hand observations in a natural setting, thus providing a foundation for conducting further review.

We use focused in-depth case studies to explore collaboration enablers and links between them, following the five-stage research process presented by Stuart et al. (2002). The first stage consists of defining the research question with the objective of contributing to theory development. In this research, we use the case studies to investigate the relationship between HLC operational activities and the satisfaction with the collaboration through the mediation of relational factors.

The second stage consists of developing a measurement instrument to capture data for future analysis. In this chapter, a questionnaire was developed containing questions relative to the different propositions (see Appendix 1). It includes semi-close ended questions, aiming to investigate the collaboration context, objectives, partners and outcomes, as well as to understand which enablers and barriers had an influence on the collaboration, i.e. the formulated propositions. The study protocol was developed in such a way that validity requirements are insured, namely construct, internal and external validity. Construct validity

means that the measurements reflect the phenomenon they are supposed to measure. Internal validity means that the proposed relationships exist and are not caused by elements external to the research context, while external validity refers to the possible generalization of the studied causal relationships.

To ensure construct validity, the triangulation method was used. Four interviews per case study were conducted for approximately 3 hours each, which allowed the interviewees to freely speak about the development of the collaboration and the faced challenges while making sure the conversation uncovers all pertinent data. Internal validity was assessed by comparing patterns from both cases to check if the findings are similar in the context of Moroccan AFSCs. External validity was established through selecting cases in such a way that they differ as widely as possible, representing both competitive and non-competitive collaborative settings, cover different logistics activities, use different collaboration structures, present different collaboration intensities, and operate in different food supply chains.

The third stage of the process represents data gathering. Data was collected by means of semi-structured interviews as they represent a flexible instrument to get into the field and become familiar with the studied object (Seuring, 2008). Semi-structured interviews also allowed the informants to discuss related issues outside the interview structure allowing for broader responses and increasing the chances of gathering relevant data (Chivaka, 2005). As the interviewees were not comfortable with recording the interviews, the interviewer took notes manually. To facilitate this process, the interviews were conducted in two phases. The objective of the first phase was to get an overview of the collaboration experience, in terms of the involved firms and their objectives, the partner's selection process, the concerned logistics activities, the structure the collaboration took, the various stages of the collaboration, and the collaboration outcomes. The second phase was directed towards identifying the factors that influenced the setup and operationalization of the collaboration.

The fourth stage of the process is relative data analysis. To extract patterns and simplify the descriptive information, the interviews were analysed using content analysis (Creswell, 2014), following Schilling (2006)'s five levels of qualitative content analysis. They consist of (i) transcribing tapes to raw data (not applicable to our case), (ii) condensing the data through paraphrasing original text, (iii) reducing the paraphrases into preliminary categories,

(iv) refining the categories such that they reflect the research subjects, are exhaustive and mutually exclusive, (v) and finally analysing the results. The results analysis was conducted using concept mapping, i.e. a graphical representation of concepts and relationships (Schilling, 2006). The main objective was to get an understanding of how the operational activities that were conducted influenced the relational aspects of the collaboration, which in turn influenced its outcomes. The research results were then reported in this chapter, representing the fifth and final stage of the process.

3.3.2 Case #1 – a competitive collaboration in the mill industry

3.3.2.1 Collaboration context and objectives

The first case study covers the collaboration experience between two competitors operating in the mill industry in Morocco (called FIRM1 and FIRM2 to maintain anonymity). Products from the mill industry are considered as essential commodities ensuring food security in Morocco. As such, the state is highly present in the sector, ensuring an affordable flour price and protecting local production through customs fees. The first signs of the industry liberalization by the state in the early 1990s motivated the birth of collaboration experiences, as companies were looking for ways to be more competitive in the upcoming open market and increase their profitability.

Table 3.1: Case #1 companies descriptives

Firm	Activity	Location	Number of employees	Annual turnover
Firm 1	Wheat processing	Morocco	250 - 499	20-50 million euros
Firm 2	Wheat processing	Morocco	100-249	20-50 million euros

At that time, FIRM1 and FIRM2 were looking for a partner to better profit from the open market opportunities, through joint international procurement of wheat and storage. The two companies, who were present in limited regions of the country, also had the objective to extend the collaboration into the manufacturing activity to extend their presence to a larger geographical area and develop new products/technologies. Two parameters were taken into consideration during the identification of potential partners:

- A high level of product and processes similarity to be able to collaborate on a wide range of activities (purchasing, storage, and manufacturing);

- The existence of prior inter-personal relationships to mitigate the risk of opportunistic behaviour;

FIRM1 and FIRM2, which (i) shared comparable products and processes, (ii) were known for their work ethic, and (iii) maintained close personal and professional relationships, decided to start discussing the idea and eventually to collaborate.

3.3.2.2 Collaboration structure

Because of the competitive nature of the collaboration, the partners were very concerned about the risk of information leakage, which motivated the adoption of a collaboration structure that guarantees information privacy. As such, they opted for the creation of separate entities that consolidate and synchronize the operations while keeping information safe.

Regarding the international purchasing activity, the partners decided to create a joint entity, which was legally registered as a wheat trading company belonging to both partners. The newly created entity, in which the partners have invested equal amounts of capital, sells the imported wheat to the two partners at a pre-determined price. This entity can also sell imported wheat to other industrials in the country to generate benefits which are then equally split between the collaboration parties. This configuration ensured that the information directly shared between FIRM1 and FIRM2 was limited to knowledge about their suppliers, the negotiated purchasing prices, and the suppliers' performance in terms of quality and reliability. Information related to the quantities to purchase was shared depending on the inventory depletion rate. The jointly created entity provided weekly updates to the two partners about the inventory level.

A similar configuration was adopted for the manufacturing activity, where one joint production facility was created and the second existing one was purchased. To ensure information privacy, the production facilities acted as independent entities, processing orders for both partners at a pre-determined price. The facilities were also allowed to process orders for other clients to generate profit. Besides the planned production quantities, which were transmitted separately to the joint production facilities, partners freely exchanged information relative to the transformation processes, product quality insurance, and the maintenance of the manufacturing units. The information exchange frequency differed depending on the partner's needs for production capacity. However, monthly meetings took place to evaluate

the performance of the production units. Figure 3.3 is a representation of the physical and information flows in the collaboration configuration adopted by the partners.

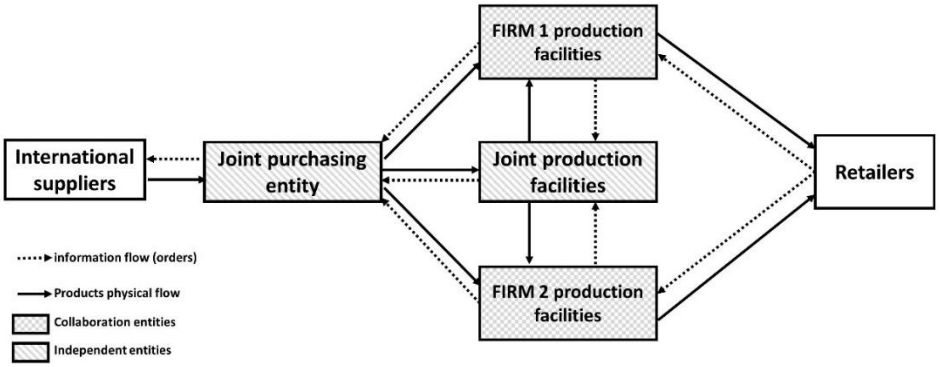

Figure 3.3: Collaboration structure adopted by FIRM1 and FIRM2

3.3.2.3 Collaboration outcomes

The two partners started collaborating on procurement in 1994, and only evolved into manufacturing in 2005. The interviewees explain the 11 years difference by the need to (i) identify potential markets for the newly created entities, (ii) gather the necessary funds to finance the required investments, and (iii) evaluate the commitment of each other before investing in production facilities.

In terms of performance, collaborative procurement allowed both parties to make savings in purchasing and transportation costs. Given that the international prices of wheat are fixed by the stock exchange, the purchasing costs were reduced by 0.1 euro per quintal, which resulted in considerable aggregate yearly savings due to the high purchased quantities. In terms of transportation cost, the interviewees were not able to provide precise information because of the lack of records from the period before 1994. Nevertheless, the average quantity per shipment increased by 25,000 tons, which provided them with more negotiation power with transporters. Concerning the manufacturing activity, the newly created facilities allowed the partners to decrease production costs by 5%.

In 2010, both partners decided to end the collaboration for two reasons. First, the views of both companies regarding the way the collaboration diverged over time. The presence of several stakeholders in FIRM1 with different visions regarding the firm's future had an impact on the effectiveness of the decision-making process within the collaboration.

Eventually, goal congruence and incentives alignment were lost, which precipitated the dissolution of the collaboration. Second, the partners were unable to reach the higher objectives they had set, which were the development of new products and technologies. The liberalization of the sector did not fully occur, making the two partners realize that opportunities they initially targeted through the collaboration were not created. In this sense, FIRM1 and FIRM2 did not feel the added value of the collaboration anymore, which led to a feeling of dissatisfaction.

Table 3.2 summarises the findings from the first case study for each factor presented in our model.

Table 3.2: Summary of the findings from the first case study

Factor	Summary of the findings
Dedicated investments	The heavy investments in the joint processing facilities provided the partners with more confidence regarding the intentions of the other party and created a dependence on the relationship.
Resource sharing	Sharing human resources (marketing personnel) created a positive atmosphere in the collaboration, promoting trust and commitment.
Information sharing	The partners exchanged complete information regarding their respective suppliers (price, performance, quality) as well as their expertise in processing wheat, which considerably increased their trust towards each other.
Joint relationship efforts	Agreeing on common goals (products to process, markets to target, objectives of the joint units) and distributing costs and benefits equally enhanced the partners' trust towards each other and their commitment to the relationship.
Partners similarity	Size similarity (both partner we similar in size and has comparable turnovers) ensured equal influence levels on the planning and execution of the operational activities. Products and process facilitated joint relationship efforts and reduced the need for adaptation.
Dependence	The dependence created through investing in joint wheat processing facilities increased the partners' commitment to the relationship in order to recoup their investments.
Trust	The initial trust level in the relationship was mainly influenced by the presence of prior inter-personal relationships. Afterwards, trust development was primarily based on the collaboration operational results and on the partners' satisfaction with the maintained relationship.
Commitment	The developed trust level in the collaboration increased the collaboration intensity (more frequent meetings, increased scope of the collaboration), indicating that the partners are more committed to the relationship.
Satisfaction with the relationship	The developed trust and commitment, resulting from the partners' collaborative behaviour resulted in a feeling of satisfaction with both the operational results and the quality of the maintained relationship. This satisfaction led to an increase in the collaboration scope from procurement to also include manufacturing.
Satisfaction with the results	

3.3.3 Case #2 – an international collaboration in food distribution

3.3.3.1 Collaboration context and objectives

The second case study covers the collaboration experience between the companies anonymously called FIRM3 and FIRM4, which are located respectively in Morocco and Turkey. FIRM3 is the leader in fruit juice production and distribution in Morocco with a market share of 19%. FIRM4 is a large biscuits manufacturer and exporter located in Turkey and which products are distributed in over 80 countries.

Table 3.3: Case #2 companies descriptives

Firm	Activity	Location	Number of employees	Annual turnover
Firm 3	Juice processing and distribution	Morocco	250 - 499	20-30 million euros
Firm 4	Biscuits manufacturing	Turkey	500-999	70-90 million euros

Because of the imbalance between volume and weight when it comes to liquids, FIRM3 faced low trucks capacity utilization. In fact, while the truck utilization in terms of weight reached 80%, less than 40% of its volume was used. The trucks utilization was also impacted by the seasonality of demand for juice, which drops by 50% during winter. In this regard, the company was looking to improve its trucks capacity utilization through collaborative transportation. According to the interviewees from FIRM3, five parameters were taken into consideration during the identification of potential partners, namely the potential partners should:

- be companies in the agri-food sector to comply with food safety regulations;
- offer products with a high volume to weight ratio;
- offer products with an inverse seasonality in demand;
- offer products with similar transportation and storage conditions to juice;
- offer products with similar customers and distribution channels.

FIRM3, through an internal selection process, narrowed down the potential products within the food industry that verify at least one of the five conditions to 4 product families. These product families are bottled olive oil, canned products, cheese, and biscuits. Among these possibilities, FIRM3 opted for biscuits since it represented the most compatible products with juice. Biscuits/cakes are food products with a high volume to weight ratio. Their demand

shows an inverse seasonal pattern to juice (high during the school year and low during summer). In addition, the two products required relatively similar temperature and humidity levels and could be handled using the existing logistics equipment. Finally, juice and biscuits are sold through the same distribution networks and are perceived by customers as complementary products in purchasing (e.g. parents buying both juice and biscuits for their kids in school).

After screening companies in the national biscuits industry, FIRM3 was not able to identify potential partners since the local biscuit industry is composed of large multinational corporations (e.g. Kraft Foods and Mondelez), which FIRM3 wanted to avoid because of power imbalances, and local manufacturers which were already running in full capacity. Therefore, FIRM3 shifted its attention to the international market for potential companies that would want their products to be distributed in Morocco. Keeping in mind that large multinational corporations should be avoided, the company was looking for partners of comparable size, which are preferably located in countries with whom Morocco has signed trade agreements. In this regard, Turkey appeared as an interesting country to look for partners.

3.3.3.2 Collaboration structure

The legal framework regulating the distribution of foreign products on the national market requires international companies to have a representing entity in the country, which would import and distribute their products. Because FIRM4 does not have any local company importing its products, FIRM3 had to take over the role of the importer. In this configuration, FIRM3 would bear all the risks relative to marketing and selling the product on the local market. To compensate for the risk, both parties agreed that FIRM3 would be the exclusive representative of FIRM4 in Morocco and that 60% of the marketing costs would be covered by the Turkish company. The contract signed between the two partners stipulated the sales objectives, the participation of FIRM4in the marketing costs, the payment conditions, and terms relative to the brand protection. Concerning the financial flows, FIRM3 pays FIRM4for the shipped merchandise upon its receipt. It then proceeds to market the products and keeps all the profit that is made. The marketing costs are then communicated to FIRM4, which reimburses 60% to FIRM3. Through this participation in the marketing costs, FIRM4 hopes

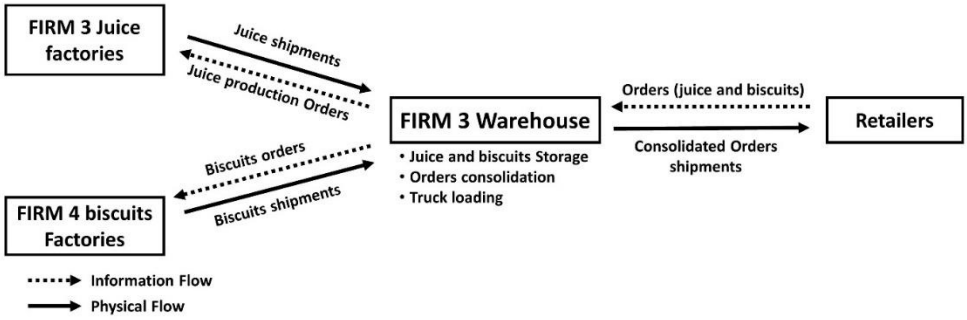

Figure 3.4: Collaboration structure adopted by FIRM3 and FIRM4

3.3.3.3 Collaboration outcomes

to increase the demand for its products on the Moroccan market, which would make FIRM3 order more quantity. Figure 3.4 shows the configuration adopted by FIRM3 and FIRM4.

The fact that both partners did not maintain prior personal and professional relationships and were uncertain about the collaboration outcomes resulted at first in a low-intensity collaboration, characterized by a low volume of transactions (4 containers a month on average). Based on the experience from the first year, both parties developed more trust and commitment in the relationship, which resulted in a 100% increase in the volume of operations in the second year. Regular information exchange meetings regarding sales, projected demand, inventory levels and shelf life, and promotional activities were taking place. During the third year, FIRM3 reached its objective to increase its trucks utilization to 100% in terms of allowed weight and 80% in terms of volume, which resulted in 15% decrease in the transportation cost. This situation was also beneficial for FIRM4, with approximately 5% increase in yearly revenues.

The rapid growth from a low to a high-intensity collaboration created several challenges for both parties. The variety of products imported by FIRM3 (66 different products), which differ in terms of demand pattern and variability, shelf life, and order lead time made the operational planning difficult for both parties. Therefore, the partners decided to scale down the number of imported references, focusing on products with interesting margin and high shelf life.

Table 3.4 summarises the results from the second case study for each factor presented in our model.

Table 3.4: Summary of the findings from the second case study

Factor	Summary of the findings
Dedicated investments	No dedicated investments were made in this case study
Resource sharing	Sharing transportation and storage capacity (trucks and warehouse space) resulted in satisfying operational results, which had a positive influence on the partners' commitment.
Information sharing	The partners' regular information exchange on sales, inventory levels, and project demand had a positive impact on trust and commitment in the relationship.
Joint relationship efforts	The partners agreed on common goals relative to FIRM4 biscuits distribution in Morocco, jointly planned biscuits manufacturing and distribution, as well as the promotional activities. The partners were also able to agree on a fair costs/benefits allocation mechanism. These elements together enhanced the partners' trust towards each other and their commitment to the relationship.
Partners similarity	The similarity in terms of transportation and storage conditions and the distribution network allowed the partners to easily plan product distribution using the existing logistics equipment and infrastructure.
Dependence	No dependence originating from dedicated investment was identified
Trust	The trust level developed in the case study has mainly resulted from the satisfying operational results and the absence of behavioural hazards. The fact that the partners shared similar cultural values also contributed to developing trust in the relationship.
Commitment	Developing trust resulted in an increase in the collaboration intensity (number of containers tripled over 3 years), which according to the partners is a sign of their strong commitment to the relationship.
Satisfaction with the relationship	Both trust and commitment contributed to the generation of a feeling of satisfaction, which in turn led to an increase in the collaboration intensity in terms of the number of products subjects to the collaboration and the yearly volume of operations.
Satisfaction with the results	

3.4 Findings and discussion of the results

The conducted case studies allow us to address the formulated propositions and complement them with further elements from the context.

Proposition 1: Investing in relationship-specific assets enhances trust and commitment in the relationship by providing evidence of the partner's engagement and generating a dependence between the partners.

The first case study provides indications supporting the influence of relationship-specific investments on the members' trust and commitment. The joint manufacturing entities required considerable investments in land, buildings, equipment, and human resources. These investments not only provided each party of the collaboration with more confidence regarding the positive intentions of the other party, which increased their trust, but also created dependence in the relationship, as the investments could only become profitable in the case of joint usage of the production capacity. These two elements led to a stronger commitment from the partners.

Proposition 2: Sharing complementary resources enhances trust and commitment by providing evidence of the partner's engagement in the relationship.

Sharing complementary resources was identified as an enabling factor in both case studies. FIRM1 and FIRM2 mainly shared human capital in running the joint entities. According to the interviewees, this dedication created a positive atmosphere in the relationship, promoting trust and commitment. The second case study does not provide insights into the relationship between resource sharing and trust. Sharing resources resulted in positive performance (improving truck capacity utilization), which was identified as having a positive influence on commitment in the relationship.

Proposition 3: Information sharing increases the trust and commitment in the relationship by allowing partners to better understand each other processes and jointly plan collaboration activities.

Indications supporting the positive influence of information sharing on trust and commitment was identified in both case studies. Despite the competitive nature of the first case study, both parties freely exchanged information regarding their expertise in manufacturing processes. Exchanging expertise and know-how for the benefit of the group was considered by both partners as a trust development lever. In the second case study, the partners exchanged timely information regarding sales, projected demand, inventory levels and shelf life, and promotional activities. According to the interviewees, information sharing is believed to have positively influenced their trust levels, which resulted in more commitment. The case studies also highlight the positive influence of trust on information sharing. The increasing trust level in both cases resulted in more frequent and exhaustive exchange of information.

Proposition 4: Joint relationship efforts (common goal, joint planning and execution, joint performance measurement, incentives alignment) improve the partners' trust and commitment in the relationship.

The case studies revealed that joint relationship efforts have improved the trust and commitment in the relationship. The interviewees from the first case study have considered setting up common goals as a pre-requisite to making any relationship-specific investment. According to them, defining a common ground increased their confidence that both partners are working towards the mutual benefit of the group, which increased their trust and

commitment in the relationship. Similarly, the interviewees from the second case study also stressed on the fact that agreeing on mutually beneficial common goals increased their commitment towards the relationship.

Regarding joint planning and execution of collaborative activities, the first case did not provide many insights, as the day to day planning of activities was performed by the jointly created entities. The interviewees from the second case identified joint planning as a factor that influenced their trust level and commitment in the relationship. Through mutual planning of biscuits manufacturing, importation, distribution, and promotional activities, the partners developed a clear idea about their engagement in the collaboration, making sure that all planned operations lead to the mutually agreed goals.

Finally, all interviewees have argued that the presence of fair cost and benefits allocations mechanisms enhanced trust and commitment between the partners. FIRM1 and FIRM2 agreed to invest equally in the collaboration and collect equal amounts from the benefits generated by the collaborative entities. Concerning the second case, the risks taken by FIRM3 were compensated by FIRM4 participation in the marketing costs.

Proposition 5: Partners' size, product and process similarity is expected to facilitate joint relationship efforts

Size similarity was identified as a key factor influencing joint relationship efforts in both case studies. In the first case study, the partners claim that size similarity provided them with equal influence levels in the relationship, which meant every decision regarding planning and executing activities required both parties input. Similarly, the FIRM3 and FIRM4 reported an increase in their commitment to joint relationship efforts when they perceived they had a fair share of input in deciding about the number of products to import to Morocco and what the financial contribution of each party would be. Partners in both cases agree that size similarity had ultimately a positive impact on their commitment.

Product and process similarity was also identified as a key facilitator of joint relationship efforts. Partners in the first case were both operating in the mill industry with equivalent products and processes, which facilitated the understanding of each other's business, thus diminishing the need for adaptation. According to them, similarities in business and manufacturing processes made joint planning and execution more efficient. In the second

case, product similarity was one of the main parameters considered by FIRM3 in choosing the collaboration partner. The fact that the partners' products shared similar storage and transportation conditions and were sold through the same distribution network allowed for easier planning and execution of distribution.

Proposition 6: Dependence enhances the partners' commitment to the relationship.

The dependence generated through investing in relationship-specific assets in the first case study contributed to the commitment of the partners to the relationship. According to the interviewees, the joint manufacturing facilities required considerable investments, and their production capacity was calculated based on the needs of both firms. As such, the partners were aware that they could only earn back their money via the joint usage of the facilities, which influenced their level of commitment.

Proposition 7: Trust enhances the partners' commitment in the relationship through the belief that each member will fulfil their obligations

The conducted case studies show indications of the influence of trust on the commitment of the partners. Both case studies started as a low-intensity collaboration, due to the uncertainty regarding the partners' behaviour and the profitability of the partnership. Based on the performance results from the first year, and the observed engagement of both partners in the relationship, the partners developed more trust towards each other. This situation had led to an increase in the collaboration intensity in both cases. The interviewees recognize the increase in the intensity as a proof of commitment from both parties.

Proposition 8 and 9: Trust and commitment improve the outcomes of collaboration.

The case studies also show that building trust and commitment improves the outcomes of the collaboration. Both case studies started as low-intensity collaborations, which developed over time as the trust and commitment of the collaboration members increased. In the second case study, the trust and commitment developed during the first year led to a 100% increase in the volume of operations in the second year, which resulted in higher operational performances. Additionally, the interviewees stressed on the fact that besides the operational improvement, the trust and commitment building process gradually resulted in a feeling of satisfaction with the relationship.

Proposition 10: AFSCs characteristics increase the importance of partners similarity in the relationship

Through the second case study, we could identify the effect of AFSCs characteristics on the collaborative activities. First, strict food safety regulations limited the choice of possible partners in the agri-food sector. Second, the seasonality in juice consumption motivated the decision to choose a partner making products that have an inverse seasonality pattern to ensure high utilization of the assets during different periods of the year. Finally, the specific handling conditions of food product motivated the choice of a partner making products that require similar transportation and storage conditions. These observations strengthen the position of the partner's similarity as a key factor for HLC in AFSCs.

Table 3.5 summarizes the findings from the case studies. All the formulated propositions were supported in the first case. In the second case study, two propositions originating from vertical collaboration literature were not supported. Because the second case study was primarily based on resource sharing, neither the influence of dedicated investments on trust and commitment, nor the impact of dependence on commitment was identified.

Table 3.5: Propositions results

Proposition	Case #1	Case #2
P1	Supported	Not applicable (no dedicated investments were made in this case)
P2	Supported	Supported
P3	Supported	Supported
P4	Supported	Supported
P5	Supported	Supported
P6	Supported	Not supported (no dependence originating from dedicated investment was identified)
P7	Supported	Supported
P8	Supported	Supported
P9	Supported	Supported
P10	Supported	Supported

The conducted cases have also revealed some country *cultural factors* which had an influence on the trust level in the relationship. First, *sharing similar cultural values* and the presence of *interpersonal relationships* were considered as relational control mechanisms that contributed to developing trust. Their presence provided a trust base to start the collaboration in case #1, while their absence in case #2 had a negative effect on trust, materialized by a low initial intensity of the collaboration. The influence of these two factors on trust has previously

been discussed by Cai et al. (2010) and Chen et al. (2010) in the Chinese context, where *Guanxi* (i.e. a type of informal personal relationship) provides a powerful relational governance structure and plays an important role in building trust. Second, both cases reveal that the high sense of *uncertainty avoidance*, i.e. the extent to which firms try to avoid ambiguous situations (Zhang and Cao, 2018), which prevailed between the partners also had a limiting effect on the collaboration intensity by means of low trust levels. This observation is in line with the work of Hwang and Lee (2012), who highlight the moderating effect of uncertainty avoidance on trust development, specifically the trust in the partner's ability and integrity. In strong uncertainty avoidance countries such as Morocco (Hofstede, 2019), individuals feel threatened by uncertain situations, which negatively impacts trust.

Finally, it is important to note that HLC remains a dynamic system, in which collaborative activities affect the collaboration outcomes through the mediation of relational constructs and vice versa. The two cases start with a low-intensity collaboration, characterized by low levels of trust and commitment from the partners. However, given the satisfying results from the first-year experience, from both operational and relational perspectives, the partners developed more trust and commitment toward each other, leading to more intensive operational activities in terms of information sharing and joint relationship efforts. This result is in line with the framework proposed by Pomponi et al. (2015), which assumes that trust among partners is developed through increased and continuous collaboration. Figure 3.5 illustrates our conceptual model for HLC based on the results supporting the formulated propositions as well as the additional insights from the case studies. The dashed boxes represent additional elements to the initial model based on HLC and AFSCs characteristics, as well as the findings from the case studies. The arrows going back from collaboration outcomes to the relational elements, and then to the collaborative activities represent the feedback effect that the results have on the members' willingness to collaborate.

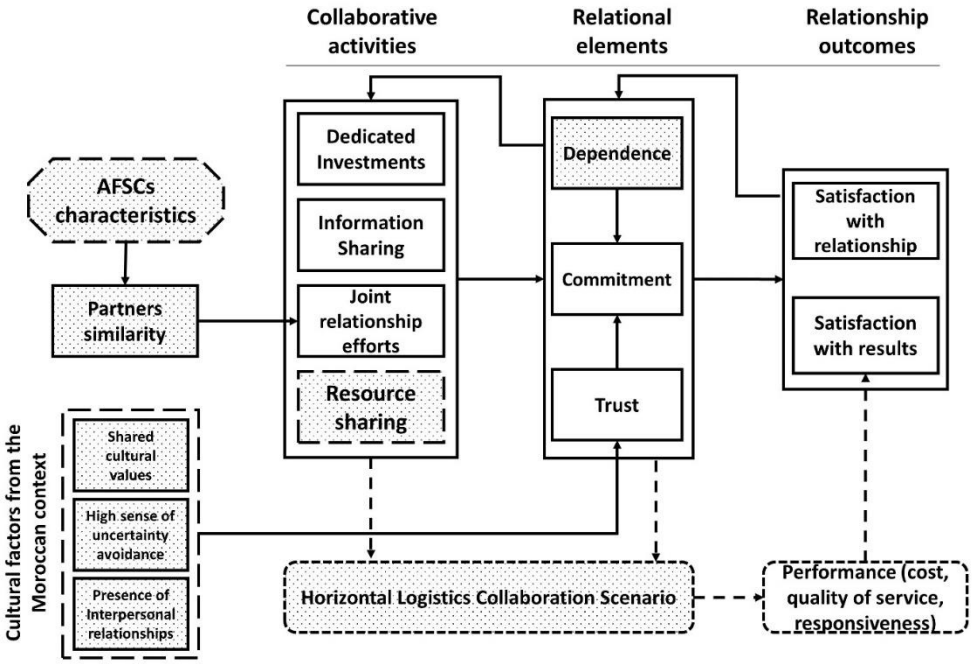

Figure 3.5: Updated horizontal logistics collaboration conceptual model

3.5 Conclusions

In this chapter, we develop a conceptual model for HLC considering AFSCs. The model links collaboration activities to collaboration outcomes, with the mediation of relational constructs. The contribution of this chapter is threefold. First, we develop a conceptual model for horizontal logistics collaboration based on insights from both vertical and horizontal collaboration literature. Second, we investigate the influence of AFSCs specific characteristics on the collaboration operational enablers. Finally, we explore the model in the context of AFSCs in Morocco through case studies to further understand collaborative relationships in a developing country.

The research has many implications relative to the AFSCs. The case studies revealed that AFSCs characteristics have a limiting effect on collaboration, as reported by Dania et al. (2018). The strict food safety regulations and the products specific requirement limit the choice of possible partners to companies from the agri-food sector, whose products require similar handling conditions and present low interaction risks. The seasonality in food products demand and production also limits the potential partners to those offering products with inverse seasonality, which allows increasing the utilization of the assets. Regarding

assets utilization, both case studies show that the required expensive technical equipment in AFSCs increased firms' willingness to collaborate by mutually investing in dedicated facilities (case 1) and sharing technical resources (case 2).

On the relational level, the case studies show that trust remains the main element limiting the collaboration intensity. Both cases started with a low-intensity collaboration, as companies were yet to develop trust towards each other. The encouraging initial results, in terms of operational performance and the absence of behavioural hazards, motivated the increase in the intensity. The cases have also revealed three factors from the study context which influence trust, namely uncertainty avoidance, interpersonal relationships, and shared values.

As the research draws from only two cases from the same context, further research can apply the framework in other developing countries to test its replication. Also, a comparison between findings from developed and developing countries can be conducted to test the moderating role context characteristics have on collaboration enabling factors. Finally, survey-based empirical testing is required to quantify the relationship in the conceptual model.

Chapter 4 - Examining the Antecedents of Horizontal Logistics Collaboration: The Influence of Industry and Country Contexts

This chapter is based on:

Badraoui, I., van der Lans, I., Boulaksil, Y., van der Vorst, J.G.A.J. Examining the Antecedents of Horizontal Logistics Collaboration: The Influence of Industry and Country Contexts. *Submitted to an international scientific journal*

In this chapter, we investigate RO2b:

To examine the industry and country contexts effect on the factors influencing horizontal logistics collaboration outcomes

Abstract

Horizontal Logistics Collaboration has proven to be difficult to implement (Basso et al., 2009). Prior studies on the factors influencing HLC's success have shed light on several collaboration enablers and barriers. However, the role that context plays in HLC has not received sufficient attention, specifically regarding the specificities of agri-food supply chains (AFSCs) and developing countries. The objective of this chapter is to explore the impact of country and industry contexts on the relationship between collaboration activities and collaboration outcomes. The results support the hypotheses that collaboration activities, such as information sharing, resource sharing and joint efforts, lead to better trust and commitment, which in turn lead to improved satisfaction. Comparing the model in different contexts reveals a high level of similarity; nevertheless, the invariance test reveals some differences across contexts. First, the effect of dependence on commitment is significant in the food sample and non-significant in the non-food sample. Second, firms in high-income countries are more likely to commit to the relationship once trust is established, whereas firms in low-income countries are more likely to be satisfied with the relationship as a result of developed trust.

4.1 Introduction

Today's highly competitive business environment has pushed companies to strive to deliver the best possible value to their customers. As such, more and more firms are seeking collaborative relationships outside their organizational boundaries to be efficient and achieve a competitive advantage (Richey et al., 2012). Among these collaborative strategies, Horizontal Logistics Collaboration (HLC) has gained much attention in recent years (Martin et al., 2018). HLC refers to the situation where two (or more) companies, operating at the same supply chain level, decide to work together to attain benefits such as cost and CO2 emissions reduction. Nevertheless, despite the potential benefits of HLC, successful real-world cases are rare (Basso et al., 2019). This raises the need to better understand why a strategy with so many advantages fails in practice by investigating the factors influencing its outcomes.

Compared to the well-established literature on vertical collaboration, contributions on which factors influence HLC outcomes are rather limited (Martin et al., 2018). The existing literature on HLC includes collaborative transportation (Cruijssen, 2007, Verstrepen et al., 2009; Verdonck 2017; Yalimaz and Savasaneril, 2012), purchasing (Bakker et al., 2008; Schotanus et al., 2010; Walker et al., 2013; Muhewezi, 2010), warehousing (Reaidy et al., 2015), and manufacturing (Bahinipati et al., 2009; Monroy and Arto, 2010; Seok and Nof, 2014). These contributions highlight several factors with a potential impact on HLC outcomes, which can be grouped into factors that are similar to vertical collaboration enablers (e.g., information sharing, dedicated investment, trust, commitment), and factors specific to HLC (e.g., shared or geographically close customers or suppliers, partners' similarity). Nevertheless, these contributions simply list relevant collaboration factors without empirically investigating their relationship with HLC outcomes. As such, understanding and quantifying the causal relationships between HLC enabling factors and its outcomes remain a priority.

In researching the factors affecting HLC outcomes, the role that context plays has not attracted much attention Saenz et al. (2015). According to the authors, a firm's industry and country contexts define which HLC enablers and barriers influence collaborative attitudes. While research on horizontal collaboration does not provide evidence supporting this premise, the literature on vertical collaboration shows that context micro and macro factors

can enable or hinder the development and implementation of collaboration (Matopoulos et al.,2007; Flynn et al., 2010; Van der Vaart et al., 2012; Rossi et al., 2013; Zhang and Cao, 2018). Nonetheless, existing empirical studies have only considered the case of manufacturing industries in developed countries (Hudnurkar et al., 2014), raising questions regarding the applicability of the findings to Agri-Food Supply Chain (AFSCs) and developing countries. On the one hand, agri-food supply chains unique characteristics (e.g., transportation and storage requirements, limited shelf life, strict food safety regulations, etc.) differentiate it from other manufacturing supply chains. To date, a substantial number of contributions on collaboration in AFSCs exist, but the research that investigates factor influencing collaboration in AFSCs is still much limited (Dania et al., 2018). On the other hand, developing countries differ from developed countries in terms of political, economic, socio-cultural and demographic characteristics (Mersha, 1997). Therefore, a better understanding of the industry and country context effect on HLC enablers and barriers remains essential to increase its chances to succeed.

In light of the above discussion, this paper has two main objectives. First, we study the relationship between collaborative actions and collaboration outcomes, through the mediation of relational constructs, for companies in developing and developed countries, as well as in- and outside the agri-food industry. Second, we examine the similarities and differences between these different contexts by comparing the importance of operational and relational constructs. The model developed in this paper builds on existing models for vertical collaboration and includes additional factors specific to the case of horizontal collaboration. The aim is to understand whether industry and country contexts have an influence on the relationship between the collaboration activities, the mediating relational constructs, and collaboration outcomes.

The contribution of this paper is threefold. First, a conceptual model taking into consideration the specificities of horizontal collaboration is developed. Second, the role of context in collaboration is examined and the context influence is identified. Third, the influence of industry and country contexts in collaboration is investigated by comparing samples from different industry and country categories. Theoretically, this research will contribute to the body of knowledge on horizontal logistics collaboration (HLC) through increasing the understanding of factors contributing to its success and elucidating the influence of context.

Operationally, it will offer a basis for collaboration experiences across industries and countries.

The rest of the chapter is structured as follows. Section 4.2 discusses the theoretical foundations of this study, where scientific contributions relative to contextual effects and horizontal collaboration enablers and barriers are reviewed and hypotheses are formulated. Sections 4.3 and 4.4 present the instrument development, data collection, and data analysis methods. Section 4.5 and 4.6 present and discuss the results of the chapter, while Section 4.7 and 4.8 discuss the research implications as well as the limitations of the study.

4.2 Theoretical foundations and hypothesis development

4.2.1 The antecedents of horizontal logistics collaboration

4.2.1.1 Factors affecting supply chain collaboration

Considering the limited literature on factors influencing HLC outcomes, the conceptual model developed in this research builds on the accumulated knowledge from vertical collaboration literature. Even though the nature of vertical relationships is different, several factors influencing its outcomes also apply to horizontal collaboration (Basso et al., 2019). More specifically, our conceptual model follows the models of Walter (2003), Vereecke and Muylle (2006), Nyaga et al. (2011), and Cao and Zhang (2011), which link the collaboration activities to the collaboration outcomes through the mediation or moderation of relational enablers. For the sake of developing a parsimonious model, we rely on Hudnurkar et al. (2014) review of factors influencing vertical collaboration as a starting point to identify the most recurring factors in the literature. The review is then updated with recent studies on vertical collaboration and with the existing contributions on horizontal collaboration. Table 4.1 summarizes the identified vertical collaboration enabling factors.

Table 4.1: Factors affecting vertical collaboration (adapted from Hudnurkar et al., 2014)

Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Trust	X	X	X	X	X	X	X	X	X	X	X	X	X													
Commitment	X	X	X	X	X	X		X																		
Adaptation	X	X																								
Collaboration promotor	X																									
Enabling technology													X	X	X											
Collaboration level						X								X												
Goal congruence										X				X		X	X			X						
Process integration														X				X	X							
Dependence		X			X																X					
Legal protection							X										X									

Sources: 1-(Walter, 2003), 2-(Fynes et al., 2005), 3-(Chen et al., 2011), 4-(Kwon and Suh, 2004), 5-(Nyaga et al., 2010), 6-(Zacharia et al., 2009), 7-(Cai et al., 2010), 8-(Chen et al., 2010), 9-(Fawcett et al., 2008a), 10-(Forslund and Jonsson, 2009), 11-(Fawcett et al., 2012), 12-(Simatupang et al., 2004), 13-(Crook et al., 2008), 14-(Angerhofer and Angelides, 2006), 15-(Lee et al., 2011), 16-(Tan et al., 2006), 17-(Jin and Hong, 2007), 18-(Simatupang and Sridharan, 2005), 19-(Simatupang and Sridharan, 2008), 20-(Cao and Zhang, 2011), 21-(Kalwani and Narayandas, 1995), 22-(Liu and Wang, 2011), 23-(Koçoglu et al, 2011), 24-(Stank et al, 2001), 25-(Simatupang et al., 2002), 26-(Simatupang and Sridharan, 2002)

Table 4.1: Factors affecting vertical collaboration (continued)

Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Government support							X																			
Interpersonal relationships							X																			
Information sharing			X	X	X	X	X	X									X	X	X	X			X		X	X
Collaborative planning			X				X											X	X	X					X	X
Incentive alignment				X	X			X	X											X						
Resource sharing and dedicated				X	X			X	X											X						
Joint knowledge creation						X			X				X							X					X	
Information availability			X																							
Information quality			X																							
Behavioural uncertainty			X	X				X							X											

Sources: 1-(Walter, 2003), 2-(Fynes et al., 2005), 3-(Chen et al., 2011), 4-(Kwon and Suh, 2004), 5-(Nyaga et al., 2010), 6-(Zacharia et al., 2009), 7-(Cai et al., 2010), 8-(Chen et al., 2010), 9-(Fawcett et al., 2008a), 10-(Forslund and Jonsson, 2009), 11-(Fawcett et al., 2012), 12-(Simatupang et al., 2004), 13-(Crook et al., 2008), 14-(Angerhofer and Angelides, 2006), 15-(Lee et al., 2011), 16-(Tan et al., 2006), 17-(Jin and Hong, 2007), 18-(Simatupang and Sridharan, 2005), 19-(Simatupang and Sridharan, 2008), 20-(Cao and Zhang, 2011), 21-(Kalwani and Narayandas, 1995), 22-(Liu and Wang, 2011), 23-(Koçoglu et al, 2011), 24-(Stank et al, 2001), 25-(Simatupang et al., 2002), 26-(Simatupang and Sridharan, 2002)

Table 4.1: Factors affecting vertical collaboration (continued)

Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Organization collaborative culture																X	X									
Integrated policies																X										X
Top management commitment									X							X										
Collaborative performance system									X	X								X	X							X

S Sources: 1-(Walter, 2003), 2-(Fynes et al., 2005), 3-(Chen et al., 2011), 4-(Kwon and Suh, 2004), 5-(Nyaga et al., 2010), 6-(Zacharia et al., 2009), 7-(Cai et al., 2010), 8-(Chen et al., 2010), 9-(Fawcett et al., 2008a), 10-(Forslund and Jonsson, 2009), 11-(Fawcett et al., 2012), 12-(Simatupang et al., 2004), 13-(Crook et al., 2008), 14-(Angerhofer and Angelides, 2006), 15-(Lee et al., 2011), 16-(Tan et al., 2006), 17-(Jin and Hong, 2007), 18-(Simatupang and Sridharan, 2005), 19-(Simatupang and Sridharan, 2008), 20-(Cao and Zhang, 2011), 21-(Kalwani and Narayandas, 1995), 22-(Liu and Wang, 2011), 23-(Koçoglu et al, 2011), 24-(Stank et al, 2001), 25-(Simatupang et al., 2002), 26-(Simatupang and Sridharan, 2002)

The summary table presented above shows that factors such as *trust, commitment, dependence, information sharing, resource sharing and dedicated investments, goal congruence, collaborative planning, and incentives alignment* are the ones that are most referred to in the literature as having an influence on the collaboration outcomes. Recent empirical studies have also used these factors in studying supply chain collaboration. Zhang and Cao (2018) considered *information sharing, goal congruence, decision synchronization, incentives alignment, resource sharing,* collaborative communication and joint knowledge creation in studying the impact of culture and inter-organisational system appropriation on collaboration. Wu and Chiu (2018) used *information sharing and communication as well as collaborative planning and implementing* to investigate the impact of social capital, justice and technology use on collaboration. in assessing the influence of supply chain collaboration on supply chain capability and competitive advantage, Liao, Hu and Ding (2017) considered *information sharing, incentives alignment, and decision synchronization* to reflect supply chain collaboration. Um and Kim (2018) considered *information sharing, goal congruence, decision synchronization, incentives alignment, resources sharing, and collaborative communication* while studying the effect of supply chain collaboration on performance and transaction cost.

Considering the discussion above, and based on the number of references considering the different factors presented in table 4.1, we retain the following factors for our conceptual model: Trust, Commitment, Dependence, Information Sharing, Dedicated Investment, Resource sharing, and Joint relationship efforts (i.e. goal congruence, incentives alignment, collaborative planning and decision synchronization, collaborative performance systems). Our decision to retain a limited number of factors for this research is motivated by the fact that when too many variables are accounted for, they usually become too convoluted for applications and lead to reduced accuracy of the solutions (Ghauri, 2004, Hardt et al., 2012).

4.2.1.2 Factors affecting horizontal collaboration

Although scare, contributions relative to the factors influencing HLC exist for different logistics activities, namely transportation (Cruijssen, 2007, Verstrepen et al., 2009; Verdonck 2017; Yalimaz and Savasaneril, 2012), purchasing (Bakker et al., 2008; Schotanus et al., 2010; Walker et al., 2013; Muhewezi, 2010), warehousing (Reaidy et al., 2015), and manufacturing (Bahinipati et al., 2009; Monroy and Arto, 2010; Seok and Nof, 2014). In addition to the factors derived from vertical collaboration literature, these contributions

provide additional enabling factors relative to partners' similarity. Cruijssen (2006) argues that since partners in HLC mutually undertake logistics activities, their similarity in terms of products and processes becomes highly relevant. Process and product similarity facilitate joint planning and execution of activities by reducing the need to adapt to the partner's way of working and to their product requirements in terms of transportation, storage and processing conditions (Schotanus et al., 2010, Pan, 2010). Therefore, in addition to the list of factors resulting from sub-section 4.2.1.1, partners' similarity will also be considered in this study.

4.2.1.3 Conceptual model

In light of the discussion conducted in the two previous sub-sections, we developed a conceptual model linking operational collaboration factors to the collaboration outcomes, through the mediation of relational construct, as illustrated by figure 4.1 and discussed hereafter.

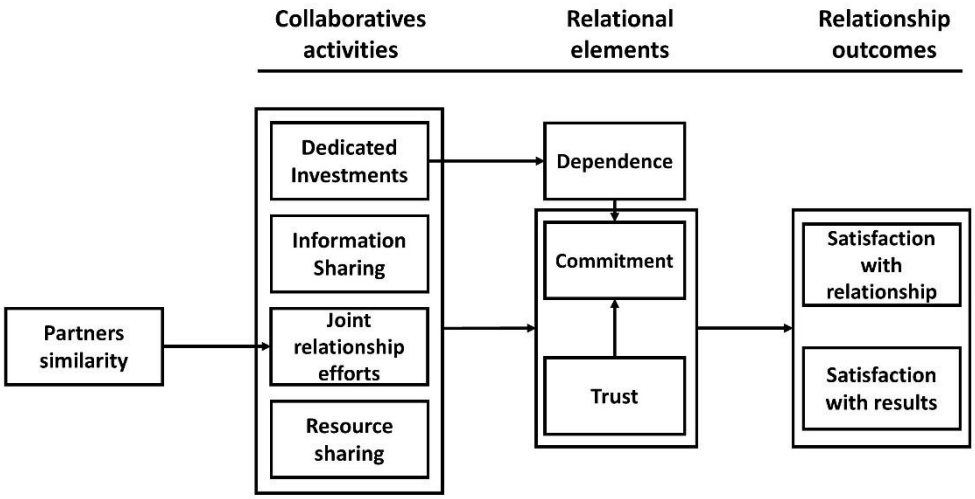

Figure 4.1: HLC conceptual model

Relationship outcomes

For firms to remain engaged in a risky and time-consuming relationship, the collaboration must create enough value and generate a feeling of satisfaction among the partners (Johnston et al., 2004, Wu and Chiu, 2018). Satisfaction can be defined as a positive evaluation of a firm's collaboration experience (Dwyer et al., 1987) and can be measured on both economic and relational levels (Zacharia et al., 2009). Economic satisfaction (later referred to as

satisfaction with the results) is based on the operational improvements resulting from the collaboration and represents a critical element influencing the firm's willingness to remain engaged in the relationship (Prahinski and Benton, 2004). Relational satisfaction (later referred to as *satisfaction with the relationship*) comes from the quality of the interaction between the partners and is related to psychological aspects such as respect and the willingness to exchange ideas. In this research, we consider the impact of trust and commitment on both satisfaction levels.

Mediating variables

Considering the difficulty to identify all possible moral hazards in advance, the contractual agreement cannot account for all the uncertainty in the relationship. As such, firms seek the development of relational governance mechanisms, such as trust and commitment (Bensaou and Anderson, 1999). The literature refers to *trust* as the key factor enabling collaborative relationships. Trust represents the degree to which a firm believes its partners have the ability and the intention to fulfil their obligations (Nyaga et al., 2010). Transaction Cost Economics Theory considers trust as a relational governance mechanism that encourages collaborative behaviour and reduces behavioural risks (Chiles and McMackin, 1996). It provides solid ground for the partners to participate in collaborative activities, i.e. share information, make dedicated investments, share and invest in resources, and engage in joint relationship efforts. Empirical studies have demonstrated a strong relationship between trust and sustained collaborative relationships (Badraoui et al., 2019; Kwon and Suh, 2004; Fynes et al., 2005, Nollet and Beaulieu, 2005; Vangen and Huxham, 2003, Nyaga et al., 2010), showing that trust has a positive influence on the partners' satisfaction with the collaboration.

Trusting partners are also expected to be more committed, as they feel confident enough to put more efforts into the relationship. *Commitment* refers to the belief that the relationship is important enough that it should endure (Morgan and Hunt, 1994). It results in performance improvement for the partners since committed members make more efforts to attain the collaboration objectives (Krause et al., 2007). Nevertheless, performance improvements can only occur when all the partners are committed to the relationship. A low level of commitment from one partner can negatively impact the commitment of the others (Schotanus et al., 2010). The influence of commitment on the collaboration outcomes has been demonstrated in the literature on vertical collaboration. Prahinski and Benton (2004)

established a positive impact of commitment on collaboration performance. Jap and Genesan (2000) showed that partners' commitment not only had a positive impact on their performance but also on their satisfaction with the collaboration. Nyaga et al. (2010) demonstrated the positive impact of commitment on collaboration performance as well as on the partners' satisfaction with the relationship. Finally, because of dedicated investments, partners might become *dependent* on the relationship to achieve the desired objectives and recoup their investments. Such dependence is believed to increase their commitment to the relationships (Abbad, 2008).

Therefore, we hypothesize that:

- H1: Dependence has a positive impact on commitment
- H2: Trust has a positive impact on commitment
- H3a: Trust has a positive impact on the satisfaction with the relationship
- H3b: Trust has a positive impact on the satisfaction with the results
- H4a: Commitment has a positive impact on the satisfaction with the relationship
- H4b: Commitment has a positive impact on the satisfaction with the results

Collaborative activities

Dedicated investments refer to investments dedicated to the relationship with a specific partner(s). These investments enable the relationship to capture higher returns and are generally associated with relationship success (Whipple and Russell, 2007). Collaboration literature emphasizes the importance of dedicated investments in developing trust and commitment in the relationship, in the sense that they provide tangible proof of the partners' intentions and engagement (Rokkan et al., 2003). Dedicated investments are also associated with developing trust and commitment as a result of investments safeguarding considerations from the partners (Jap and Ganesan, 2000; Know and Suh, 2004). Indeed, not only do they contribute to trust and the commitment building process, but they also create a dependence in the relationship as partners try to capture a return on their investment (Cruijssen, 2006). The created dependence, in turn, contributes to the commitment of partners. Firms that invest in the specific needs of the collaboration tend to bond more closely to their partners to safeguard their investments. Therefore, we hypothesize that:

- H5a: Dedicated investments have a positive impact on dependence
- H5b: Dedicated investments have a positive impact on trust
- H5c: Dedicated investments have a positive impact on commitment

Besides investing in dedicated assets, *sharing existing complementary resources* provides evidence of the partner's dedication to the relationship (Walker et al., 2013). From the perspective of the extended resource-based view theory (Lavie, 2006), sharing complementary resources allows the partners to achieve a competitive advantage. Shared resources typically include physical resources such as transportation, storage, and manufacturing equipment (Harland et al., 2004), and human resources (Walker et al., 2013). Sharing physical resources contributes to their utilization rate, thus contributing to cost reduction while sharing human resources provides access to complementary skills and expertise (Walker et al., 2013). Such a collaborative activity is expected to increase the trust and commitment levels in the relationship, as it provides partners with evidence regarding their intentions towards each other. Both case studies presented in Chapter 3 have identified the positive impact of resource sharing (personnel and the first case, trucks and storage facilities in the second case) on trust and commitment (Badraoui et al., 2019). Therefore, we hypothesize that:

- H6a: Resource sharing has a positive impact on trust
- H6b: Resource sharing has a positive impact on commitment

Information sharing refers to the process through which partners exchange accurate, complete and relevant information in the collaboration (Cao and Zhang, 2011). According to Vereecke and Muylle (2006), information sharing is fundamental in collaborative relationships because it enables collaborative efforts, reduces information asymmetry, and facilitates accurate planning and execution of collaborative activities. Thus, sharing information contributes to synchronizing the operational activities between the partners, which helps to avoid opportunity costs relative to sub-optimizations (Cruijssen, 2006). Information sharing has also been identified as an essential element in collaboration due to its vital role in achieving collaboration benefits (Sanders and Premus, 2005).

By allowing the partners to develop a better understanding of each other's processes and routines, sharing information contributes to trust and commitment building process in a relationship and helps mitigate risks relative to behavioural uncertainty (Kwon and Suh,

2004). Effective information sharing contributes to trust and commitment development as it enables the partners to develop conflict resolution mechanisms, which indicates that they can be trusted. According to Doney and Cannon (1997), the more confidential information is shared by a partner, the more indication it gives regarding its motives and intentions, which also positively influences trust and commitment. Nyaga et al. (2010) also indicate that greater sharing of information reduces uncertainty and improves the level of trust and commitment in collaborative relationships. Thus, we hypothesize that:

- H7a: Information sharing has a positive impact on trust
- H7b: Information sharing has a positive impact on commitment

Joint relationship efforts refer to processes by which partners plan, execute, and orchestrate decisions in the collaboration. They include setting up common goals, decision synchronization, joint planning, joint performance measurement, and incentives alignment (Min et al., 2005; Walker et al., 2013). While setting up common goals defines the collaboration objectives, joint planning and decision synchronization provide the basis to reach collaboration benefits (Zhang and Cao, 2018). Incentives alignment refers to the cost and benefits sharing mechanisms in the relationship, which play an important role in the willingness of the partners to cooperate (Schotanus et al., 2010). Joint relationship efforts have been identified as key elements improving trust and commitment in collaboration (Walker et al., 2013). When the partners engage in close joint relationship efforts, they are more likely to trust each other and commit to the relationship (Jap and Genesan, 2000). In vertical relationships, the opportunity to make joint decisions between buyers and sellers represents an incentive to commit (Subramani and Venkatraman, 2003).

Nevertheless, efficient joint relationship efforts require a certain degree of similarity between the partner in terms of size, product and processes (Polychronakis and Syntetos, 2007, Schotanus et al., 2010; Pan, 2010). First, size similarity balances the power in the relationship and ensure equal contribution from each partner. This aspect is essential since under-considered group members will attempt to restore equity through uncollaborative behaviour materialised by lack of trust and commitment (Schotanus et al., 2010). Second, it is argued that process similarity reduces transaction costs as the need for adaptation is diminished. Third, product similarity facilitates the execution of operational activities and makes it possible to use already existing infrastructure (Pan, 2010). The case studies presented in

Chapter 3 support the view that partners' similarity facilitates joint relationship efforts (Badraoui et al., 2019). In the first case purchasing and manufacturing processes similarity between the partners facilitated the coordination and the execution of the collaborative activities. In the second case, the similarity between juice and biscuits in terms of transportation and storage conditions allowed the partners to use the existing facilities and equipment. Thus, we hypothesize that:

- H8a: Joint relationship efforts have a positive impact on trust
- H8b: Joint relationship efforts have a positive impact on commitment
- H9: Partners' similarity has a positive impact on joint relationship efforts

4.2.2 Context effect on HLC

The literature highlights the importance of contingency research in operations management and defines *context variables as* the situational characteristics of the firm/individual, are external to the organization and cannot be easily manipulated. Changing such variables is only possible on the long-term and requires considerable efforts. The literature on collaborative relationships identifies several contextual factors influencing collaborative relationships and classifies them into different categories, namely:

- *Industry characteristics:* represent the characteristics of the sector or the supply chain in which the collaborative practices are taking place, which varies from a sector/supply chain to another. Supply chain characteristics, such as the degree of information sharing and the supplier-buyer power relationship (Kirezieva et al., 2013), influence the collaborative actions in terms of strategies and partnerships (Patel et al., 2012).

- *Country characteristics:* refer to the institutional structure and attributes as well as to the community characteristics. Institutional attributes represent the formal and informal rules/regulations governing the resource system (Edwards and Steins 1999). Formal rules include policies and regulations (e.g. environmental norms, merchandise transportation regulation, and food safety regulation), while informal rules are local norms, accepted actions, and cultural specificities defining what actions are permitted or prohibited (Mattor and Cheng, 2015).

- *Organizational characteristics:* refer to the organization structure and the individuals' attributes within the organization. The organization structure refers to the internal organization of companies, such as the departments, tasks, processes, and decision power distribution, which impacts the effectiveness of the collaboration (Patel et al., 2012). The individual attributes are the main characteristics of the decision-making individuals allowing them to engage in collaborative actions, such as prior collaboration experiences, technical skills, and leadership capabilities (Pagdee et al., 2006; Ansell & Gash, 2008).

The focus of this chapter will be on comparing models from different industries and countries, as we consider their characteristics to go beyond the companies' control and are difficult to change in the short term.

4.2.2.1 Agri-food supply chains characteristics

To better understand Horizontal Logistics Collaboration in the context of the agri-food sector, it is important to analyse AFSCs specific characteristics and identify how they influence HLC enabling factors. According to Van der Vorst et al. (2011), the unique aspects of food products give AFSCs specific characteristics differentiating them from other supply chains, such as:

- Short life cycle products;
- High volumes and high product variety;
- Long production throughput times and seasonality in farm production;
- Variability of quality and quantity of supplied products and processing yields;
- Specific requirements in transportation and storage conditions;
- Expensive technical equipment focusing on capacity utilization;
- Need to comply with national and international regulations relative to food safety and environmental issues;
- Need for traceability due to product safety responsibility

The distinctive characteristics of AFSCs influence the way partners interact with each other, raising concerns at different levels. First, the specific requirements in transportation and storage conditions define what products can be transported or stored together. Because food quality is a function of time and temperature, different products require different conditions

to deliver the right quality to the consumers (Van der Vorst et al., 2007), thus increasing the importance of partners' products similarity for horizontal collaboration in AFSCs. In addition, food products are living organisms that constantly interact with the surrounding environment (Van der Vorst et al., 2007), which emphasize the importance of products similarity. Partners' product compatibility becomes even more important in light of rigorous food safety regulations. Legislation targeting all stages in AFSCs define under which conditions food product should be produced, processed, and distributed (Akkerman et al., 2010). These constraints add an additional level of complexity to HLC, as partners similarity is not only relative to the products characteristics and interference risks, but also to legal sanitary obligations and food quality insurance requirements. Therefore, the theoretical discussion leads us to believe that partners similarity is more important to implement joint relationship efforts in AFSCs compared to other supply chains**.**

Second, AFSCs are also known to rely on expensive specialized technical equipment (e.g. refrigerated trucks), for which high capacity utilization is necessary **(**Van der Vorst et al., 2011). This characteristic, combined with the seasonal pattern of food products, represents a major challenge for AFSCs. Through adequate resources sharing and specific investments, HLC is expected to improve the capacity utilization of the specialized equipment (Vanovermeire et al., 2013), provided product and processes similarities are ensured. Therefore, the importance of resource sharing and dedicated investments is expected to be higher in AFSCs compared to other supply chains. Thus, we expect dedicated investments and resource sharing to have a higher positive impact on trust and commitment in AFSCs compared to other supply chains.

4.2.2.2 Developing countries characteristics

Country characteristics influencing HLC enabling factors are relative to the institutional context and to the country's socio-cultural characteristics. Institution and regulations can provide support in the form of a legal framework regulating collaborative actions. A strong institutional context favours the development of trust in the relationship (Fuglsang and Jagd, 2015). In contrast, firms in a weak institutional context fear the absence of conflict resolution mechanisms, which reduces the potential of trust development, and therefore commitment in the relationship. Institutional Support can also take the form of an institutional commitment to developing collaborative activities, through a clear supporting governmental agenda (Mattor and Cheng, 2015), which favours the development of commitment in collaborative

relationships. Therefore, given the weak institutional context of developing countries (Mersha, 1997), we expect that trust will have a lower positive impact on commitment in developing countries compared to developed countries.

Cultural characteristics refer to the norms, beliefs, and underlying values shared in a community regarding appropriate practices (Yunus and Tadisina, 2016). These norms and beliefs have the power to enable or hinder the development of collaborative relationships (Gopal and Gosain, 2010). Firms in countries with collaborative culture are more likely to engage in collaborative efforts based on trust and social norms instead of contractual agreements and rules (Qu and Yang, 2015). Four elements define a country's collaborative culture, namely collectivism, power symmetry, long term orientation, and uncertainty avoidance (Zhang and Cao, 2018). Collectivists societies are more likely to form collaborative relationships as they focus more on collective goals instead of individual objectives, thus encouraging information sharing and engaging in collaborative efforts (Naor et al., 2010). Societies with a strong sense of long-term orientation are more likely to commit to the collaboration by investing in the relationship. In countries with high uncertainty avoidance, firms can be more inclined to collaborate in order to share risk and uncertainty relative to market changes (Qu and Yang, 2015). However, uncertainty avoidance can also lead to collaboration resistance in case the partners are uncertain about their partners' behaviour (Badraoui et al., 2019). Finally, in a situation of power symmetry (power balance), information sharing frequency is expected to be high and partners are expected to remain engaged in collaborative efforts (Wuyts and Geyskens, 2005; Vegt et al., 2010). Considering that firms in countries with a collaborative culture are more likely to engage in collaborative activities and efforts, we expect the positive impact of collaborative activities on trust and commitment to be higher in countries with a collaborative culture.

4.3 Instrument development and data collection

Data for the study were collected by conducting a survey. Item generation for each construct in the research was conducted by adopting existing measurement items from past studies and, whenever needed, creating new items. This first step resulted in an initial list of reflective items for information sharing (Nyaga et al., 2010; Zhang and Cao, 2018, Abbad, 2008), joint relationship efforts (Nyaga et al., 2010), dedicated investments (Nyaga et al., 2010; Abbad, 2008), resource sharing (Zhang and Cao, 2018), dependence (Abbad 2008), trust (Nyaga et

al., 2010; Mayer and Davis, 1999), commitment (Nyaga et al., 2010; Abbad, 2008), satisfaction with the relationship (Nyaga et al., 2010), and satisfaction with the results (Nyaga et al., 2010). In addition, newly developed items were created to measure partners' similarity and further aspects of the collaboration results based on the work of Cruijssen (2006). 7-point Likert-scale items were used, measuring to what extent respondents agree or disagree with the statements, where 1=strongly disagree, 4= neutral, and 7=strongly agree. The compiled list of items was translated to French to collect responses from both English and French-speaking countries.

The English and French versions of the measurement instrument were pretested by an international pool of twenty academic and industry professionals who are familiar with collaboration. The French version was sent to French-speaking respondents (13) while the English version was pre-tested by English speaking professionals (7). First, structured interviews were conducted to check the clarity of the statements and whether they conveyed the same idea in both languages or not. To do so, interviewees were asked to rephrase the statements according to their understanding of it in their respective language. The interviewees were then asked to take out statements they consider to be redundant or ambiguous and to suggest further items that reflect the constructs. Based on the interviewees' feedback, the list of items was further modified, after which web and paper questionnaires with 44 items were created (Appendix 2).

The aimed respondents were professionals expected to have knowledge or experience in logistics, operating in one of the following sectors: agri-food (agriculture and food processing), climate and environment, construction and real estate, energy and water, manufacturing and assembly, transportation and logistics, and wholesale/retail. The survey targeted professionals in management positions in logistics, manufacturing, and production, as well as directors and CEOs. The aim was also to gather responses from companies operating in different countries to investigate the country characteristics' influence on collaboration.

Data were collected by using both face-to-face and self-administered surveys and lasted from January to May 2018. To ensure that the survey would reach companies operating in a wide range of industries and countries, the research team made company visits and participated in several international professional trade shows. Interviewees were given the opportunity to

choose between being interviewed or filling the paper or online survey on their own. In both cases, the interviewers provided an initial detailed explanation of what horizontal logistics collaboration stands for. In addition, the interviewers provided guidelines to the respondents on how to answer the survey in case the collaboration is still running (answers are based on the actual state), the collaboration is over (answers are based on the last known stage), multiple collaboration experiences (focus on the most important one experience), and multiple partners (provide an overall opinion about all the partners). In case the respondents have never been involved in a horizontal collaboration experience, but wish to start one in the near future, they were asked to fill in the survey based on their opinion on how the collaboration should work. The respondents did not receive specific instructions on answering the survey based on successful or unsuccessful collaboration experiences, as this aspect can be captured by their responses on the two satisfaction factors included in the survey.

In total, 364 responses were received, out of which 344 were usable. Table 4.2 shows the distribution of respondents' title and industry and country category. The majority of the respondents (92%) hold executive or manager level positions, suggesting that they have the requisite knowledge and experience to answer the survey. The respondents are mainly working in manufacturing companies (67%). The other respondents mostly work in wholesale and retail, and in logistics service companies. Responses are also grouped by country category. First, countries are grouped by income level following the World Bank (2018) in order to compare between weak and strong institutional contexts, which was hypothesised to have an impact on the relationship between trust and commitment. The upper-middle to high income (UMHI) category is mainly represented by France, Italy, Spain, The Netherlands, and Turkey. The lower-middle to low income (LMLI) category is represented by Morocco, Ivory Coast, Egypt, and Jordan. Second, we attempted to group the respondents by based on cultural characteristics, which resulted in very unbalanced groups in terms of the number of observations, both based on each individual cultural dimension and on all the dimensions simultaneously.

Table 4.2: Respondents' title, industry, and country category

Respondent's title	N	Industry Category	N	Country Category	N
Director/general manager	104	Agri-food	129	Upper middle to high income countries (UMHI)	89
Production manager	36	Manufacturing and assembly	104	Lower middle to low-income countries (LMLI)	255
Logistics manager	42	Wholesale and retail	60		
Marketing and sales managers	136	Transportation and logistics	21		
Other	26	Other	30		

4.4 Data analysis methods

4.4.1 Analysis method for the measurement and structural models

A confirmatory factor analysis with the R-package LAVAAN (Rosseel, 2012) was first used, specifying a multi-factor model including all constructs, in order to check the (i) unidimensionality, (ii) internal and composite reliability, (iii) convergent, construct, and discriminant validity, and iv) measurement invariance across subgroups. Iterative modifications were conducted, each time dropping items with loadings lower than the acceptable values (above 0.5 is acceptable, above 0.7 is preferred (Hair et al., 2010)). Analyses were carried out separately for the different samples (food, nonfood, UMHI, and LMLI).

Unidimensionality was first assessed by checking the items' loadings and their significance as well. Then, the internal consistency reliability of each construct was tested based on Cronbach's α and the composite reliability (ρ_c) values (Hair et al., 2010). A Cronbach's α higher than 0.7 and a ρ_c higher than 0.7 indicate that internal consistency reliability is achieved. Afterwards, the construct validity was tested by fitting a multifactor model containing all constructs. First, construct validity was checked using different fit indices. Considering the redundancies among them, we only report the chi-square and the associated degrees of freedom, one absolute index (e.g. RMSEA) and one incremental index (e.g. CFI), which provides sufficient basis for model evaluation (Hair et al., 2010). CFI values above 0.9 and 0.95 show respectively an acceptable and a good fit, while RMSEA value below 0.08 and 0.05 show respectively acceptable and good fit (Hooper et al., 2008). Concerning the normed chi-square, i.e. chi-square divided by the degrees of freedom, a value less than 2.0 is preferred (Hooper et al., 2008). Second, convergent validity was tested by looking at the statistical significance of the loadings and the AVE for each construct. Convergent validity

is achieved if all items loadings are statistically significant and the AVE for each construct is above 0.5 (Fornell and Larcker, 1981). Finally, discriminant validity was examined by comparing the AVE for each construct and its shared variance with the remaining constructs. A construct's AVE value larger than the squared correlations with the other constructs indicates that discriminant validity is achieved.

Additionally, steps were taken to test for common method bias. First, Harman's single-factor test was used to see if one factor accounts for most of the variance in the data. Then, a multifactor model containing both the original model constructs and a common factor on which all items are loaded was tested. Common method bias might be an issue if the common factor captures parts of the variance originally attributed to the model constructs (Podsakoff et al., 2003).

Subsequently, measurement invariance between the food and non-food, and between the LMLI and UMHI samples was tested with multifactor models following a four steps procedure: configural, metric, scalar, and strict invariance (Van de Schoot et al., 2012). Configural invariance tests whether the same measurement model is valid for each group. Metric invariance checks whether respondents across groups evaluate the construct under study the same way (i.e. factor loadings). Scalar invariance tests whether the constructs meaning and the levels of underlying items (i.e. the item intercepts) are similar across groups, thus providing ground for comparing scores on the latent variables. Finally, strict invariance checks whether the latent constructs are measured identically across groups, through fixing residual variances to be equal. To determine whether invariance is achieved, studies suggest that differences in chi-square between the baseline model and the more restricted models should be investigated (Van de Schoot et al., 2012). However, since the change in chi-square is sensitive to sample size and deviations from normality, it does not represent a realistic measure of invariance (Byrne, 2013). Therefore, in addition to the chi-square, we also consider the (i) fit of the multigroup and the (ii) change in CFA and RMSEA between models (should be <0.01 to achieve invariance (Byrne, 2013)).

Finally, structural equations modelling in LAVAAN (Rosseel, 2012) was used to test the hypotheses proposed in the conceptual framework, and to assess the model fit with the collected data. In addition, structural invariance was conducted by fitting the structural model

and constraining the structural paths to be equal across groups while keeping all scalar-invariance equality constraints for the measurement part (full structural invariance).

4.4.2 Control variables

The data analysis method explained in the previous sub-section was conducted while using two variables to control for extraneous effects. First, studies suggest that larger firms are more likely to effectively implement supply chain strategies as they possess adequate resources and capabilities (Subramani, 2004). As such, it should be included in the relationship structure as a control variable (Koufteros et al., 2007). Second, the research also tests for a possible extraneous effect emanating from the respondents' title. Five categories of respondents were identified in the data set based on their position within the company. Because HLC may not be a pertinent subject for all the respondents' title categories shown in Table 4.2, it seems adequate to include as control variables in the study.

4.5 Results

4.5.1 Measurement model

4.5.1.1 Scale properties per sample

A multi-factor model including all constructs was specified in LAVAAN and tested on the food and non-food groups as well as on the UMHI and LMLI groups (Appendix 4). After iteratively dropping items with (completely standardized) loadings lower than the recommended values (above 0.5 is acceptable, above 0.7 is preferred (Hair et al., 2010)), the final model consisted of 30 items for 10 constructs (Tables 4.3 and 4.4). All item loadings meet the recommended values and are significant at $\alpha = 0.01$, indicating unidimensionality. The fitted multi-factor model has a good fit in all samples, meaning construct validity and configural measurement invariance are achieved: CFI (food sample = 0.935, non-food sample = 0.947, LMLI sample = 0.957, UMHI sample = 0.890), NNFI (food sample = 0.921, non-food sample = 0.936, LMLI sample = 0.948, UMHI sample = 0.866), RMSEA (food sample = 0.055, non-food sample = 0.045, LMLI sample = 0.041, UMHI sample = 0.076) and normed chi-square (food sample = 1.17, non-food sample = 1.19, LMLI sample = 1.42, UMHI sample = 1.51). The constructs' internal consistency reliabilities are sufficient, as both Cronbach's α's, and ρ_c values are above 0.7. Also, all constructs show good convergent validity, with AVE values greater than the critical value of 0.5. Regarding discriminant

validity, the AVE of each construct is compared to its shared variance with the other constructs (Fornell and Larcker, 1981). The AVE values (Food sample = 56% to 78%, non-food sample = 50% to 89%, LMLI sample = 52% to 75%, UMHI sample = 61% to 78%) are larger than the squared intercorrelations for each construct in each sample, indicating good discriminant validity (Appendix 4).

Table 4.3: Constructs reliability measures and factor loadings for the Food and Non-food samples

Survey items	Food sample				Non-food sample			
	Loadings	AVE	CR	Cronbach α	Loadings	AVE	CR	Cronbach α
Information Sharing								
Is2	.757				.793			
Is3	.901	.68	.86	.86	.904	.62	.83	.82
Is4	.806				.642			
Joint relationship efforts								
jre1	.651				.731			
jre3	.886	.62	.83	.82	.884	.68	.87	.86
jre4	.806				.856			
Dedicated Investments								
dedinv1	.931				.664			
dedinv2	.756	.67	.86	.85	.802	.50	.75	.75
dedinv3	.762				.653			
Resource sharing								
rs1	.969				.920			
rs2	.900	.76	.91	.89	.902	.70	.87	.86
rs3	.735				.671			
Partners Similarity								
ps1	.502				.535			
ps2	.877	.58	.80	.78	.864	.55	.78	.76
ps3	.856				.788			
Commitment								
com1	.879				.847			
com2	.943	.78	.91	.91	.903	.70	.88	.87
com3	.815				.760			
Trust								
tr1	.854				.875			
tr2	.890	.69	.87	.86	.906	.72	.89	.84
tr3	.742				.760			
Dependence								
dep1	.932				.934			
dep2	.658	.62	.83	.81	.837	.67	.86	.85
Dep4	.752				.671			
Satisfaction with the relationship								
satisrel2	.739				.731			
satisrel3	.879	.68	.87	.86	.735	.55	.79	.79
satisrel4	.856				.762			
Satisfaction with the results								
satisres3	.764				.775			
satisres4	.792	.56	.79	.79	.729	.57	.80	.80
satisres5	.677				.759			

(AVE: Average variance extracted, CR: Composite reliability)

Table 4.4: Constructs reliability measures and factor loadings for the LMLI and UMHI samples

Survey items	LMLI sample				UMHI sample			
	Loadings	**AVE**	**CR**	**Cronbach α**	**Loadings**	**AVE**	**CR**	**Cronbach α**
Information Sharing								
Is2	.774				.766			
Is3	.897	.65	.85	.83	.958	.65	.84	.82
Is4	.736				.664			
Joint relationship efforts								
jre1	.684				.783			
jre3	.862	.62	.83	.82	.886	.77	.91	.89
jre4	.814				.952			
Dedicated Investments								
dedinv1	.727				.901			
dedinv2	.754	.52	.76	.76	.792	.67	.86	.80
dedinv3	.676				.759			
Resource sharing								
rs1	.942				.901			
rs2	.916	.75	.90	.89	.843	.64	.84	.85
rs3	.729				.631			
Partners Similarity								
ps1	.50				.517			
ps2	.900	.55	.78	.76	.963	.60	.81	.74
ps3	.766				.784			
Commitment								
com1	.884				.792			
com2	.900	.73	.89	.88	.951	.75	.90	.89
com3	.771				.844			
Trust								
tr1	.847				.926			
tr2	.841	.63	.83	.83	.962	.78	.91	.90
tr3	.680				.741			
Dependence								
dep1	.931				.953			
dep2	.767	.64	.84	.83	.726	.67	.86	.85
Dep4	.689				.753			
Satisfaction with the relationship								
satisrel2	.701				.808			
satisrel3	.775	.59	.81	.81	.911	.70	.87	.86
satisrel4	.820				.785			
Satisfaction with the results								
satisres3	.736				.853			
satisres4	.743	.54	.78	.77	.797	.61	.83	.81
satisres5	.725				.69			

(AVE: Average variance extracted, CR: Composite reliability)

4.5.1.2 Testing for common method bias

Because data were collected using the same type of questions, common method bias may be a concern. A principal components analysis on the whole sample to perform Harman's single-factor test (Podsakoff et al., 2003) reveals that the first principal component accounts

for only 20.5% of the total variance (compared to 74.5% that is accounted for when taking as many principal components as the number of constructs), suggesting that common method bias is not a major problem in the data. This conclusion was further confirmed by adding a common latent factor (CLF) to the multi-factor CFA model, with the latter being uncorrelated with the other model factors. A comparison of the model without and the model with the CLF (Appendix 4) on the whole sample revealed only very small decreases in item loadings, with a mean value of 0.025 and the 90th percentile located at 0.072. This result further confirms that common method bias is not a major issue in the data.

4.5.1.3 Assessing measurement invariance

Further two-group invariance tests were performed across the food and non-food samples as well as between LMLI and UMHI groups to check whether the constructs are measured the same way across the samples. Regarding the food and non-food samples, configural invariance is achieved as the two multifactor models show good fit (section 4.5.1.1). Second, we tested for metric invariance through imposing an equality constraint on the factor loadings across groups. The results reported in Table 4.5 show that this model also exhibits good fit. In comparison with the configural model, ΔCFI and ΔRMSEA are lower than 0.01, thus showing good metric invariance. Third, we performed a scalar invariance test by constraining the items intercepts to be equal across groups as well. The results indicate that scalar invariance in achieved as (i) the fit indices show a good model fit, and (ii) the ΔCFI and ΔRMSEA are lower than 0.01 in comparison with the metric invariance model. Fourth, we conducted a strict invariance test through constraining measurement errors to be equal across groups. Table 4.5 shows that this model also results in good model fit indices but results in a ΔCFI higher than 0.01 compared with the scalar invariance model, suggesting that some measurement errors differ across the two samples. However, strict invariance is not a pre-requisite for testing structural invariance as the residuals are not part of the latent factor (Vandenberg and Lance, 2000).

Similarly to the food and non-food samples, we conducted successive tests on the LMLI and UMHI countries samples to test for configural, metric, scalar, strict, and structural invariance. Configural invariance is exhibited as the multifactor models tested in section 4.5.1.1 show good fit. The model also shows metric invariance, with negligible change in CFI and RMSEA (ΔCFI and ΔRMSEA < 0.01). The analysis also shows that scalar invariance is achieved as

the model fits the data well and the ΔCFI and ΔRMSEA are <0.01. Regarding strict invariance, this model shows a good fit but results in a ΔCFI value greater than 0.01, meaning that some measurement errors differ across the two samples.

Table 4.5: Measurement invariance test results

Invariance tests	X^2 (df)	CFI	RMSEA	NNFI	ΔCFI	ΔRMSEA
CFA models for the Food and Non-Food samples						
Configural invariance	1021.91 (720)	0.942	0.049	0.930	n/a	n/a
Metric Invariance	1059 (740)	0.939	0.050	0.928	0.003	0.001
Scalar Invariance	1088.1 (760)	0.937	0.050	0.928	0.002	0.000
Strict invariance	1214.1 (790) *	0.918	0.056	0.910	0.019	0.006
CFA models for the LMLI and UMHI samples						
Configural invariance	1058.68 (720)	0.936	0.052	0.922	n/a	n/a
Metric Invariance	1094.14 (740)	0.933	0.053	0.921	0.003	0.001
Scalar Invariance	1127.53 (760)	0.930	0.053	0.920	0.003	0.000
Strict invariance	1257.45 (790) *	0.911	0.059	0.902	0.019	0.006

(*) significantly different than the previous model at 0.05

4.5.2 Structural model fit and hypotheses testing results

4.5.2.1 Assessing structural invariance

After testing for invariance at the measurement level, structural invariance is investigated at the structural level as well for all samples. Concerning the food and non-food samples, we first ran a structural model with unconstrained regression path while keeping the equality constraints found in the measurement part, i.e. loading and intercepts (unconstrained structural model). As shown in Table 4.6, this model fits the data well. Second, we constrain the regression paths to be equal across groups (full structural invariance). The results of the fully constrained SEM model show that it fits the data well. In comparison to the unconstrained SEM model, ΔRMSEA and ΔCFI are acceptable (respectively 0.000 and 0.002). Even though this result indicates that structural invariance is achieved, we further investigate the differences between the two samples by testing each path separately. To do so, we compared the unconstrained SEM model with SEM models where each single regression path is constrained to be equal at a time using the likelihood ratio test (Appendix 5). The results show that two structural paths are noninvariant across the two industry samples (Dependence → Commitment and Joint relationship efforts → Commitment), meaning that the empirical relations in both samples largely concur. In the light of this result, we re-ran the SEM multigroup analysis with the invariant paths constrained to be equal and noninvariant paths left as free parameters (partial structural invariance). The resulting model also fits the data well, with the path diagrams presented in figures 4.2 and 4.3.

A similar analysis is conducted on the LMLI and UMHI samples. Table 4.6 shows that the unconstrained structural model fits the data well. The fully constrained structural model (full structural invariance) also shows a good model fit and results in acceptable changes in CFI and RMSEA (<0.01). Although the results suggest that full structural invariance is achieved, we decided to further investigate the existence of differences between the groups through testing each regression path separately. Thus, we compared the unconstrained model with models where each single regression path is constrained to be equal at a time (Appendix 5). The results show that only one regression path is identified as noninvariant (Trust → Commitment), which indicates that opinions from the two country categories largely concur. Considering this result, we re-ran the SEM multigroup analysis with the invariant paths constrained to be equal and noninvariant path left as free parameters (partial structural invariance). The resulting model also fits the data well, with the path diagrams presented in figures 4.4 and 4.5.

Table 4.6: Structural invariance test results

Invariance tests	X^2 (df)	CFI	RMSEA	NNFI	ΔCFI	ΔRMSEA
SEM models for the Food and Non-Food samples						
Unconstrained structural model (compared to the scalar invariance model)	1207.98 (804)	0.922	0.054	0.916	0.015	0.004
Full structural invariance	1233.24 (820)	0.920	0.054	0.916	0.002	0.000
Partial Structural invariance	1222.73 (818) *	0.922	0.054	0.917	0.000	0.000
SEM models for the LMLI and UMHI samples						
Unconstrained structural model (compared to the scalar invariance model)	1245.24 (804)	0.916	0.056	0.909	0.014	0.003
Full structural invariance	1257.65 (820)	0.917	0.056	0.912	0.001	0.000
Partial structural invariance	1254.63 (819)	0.917	0.056	0.912	0.000	0.000

(*) significantly different than the previous model at 0.05

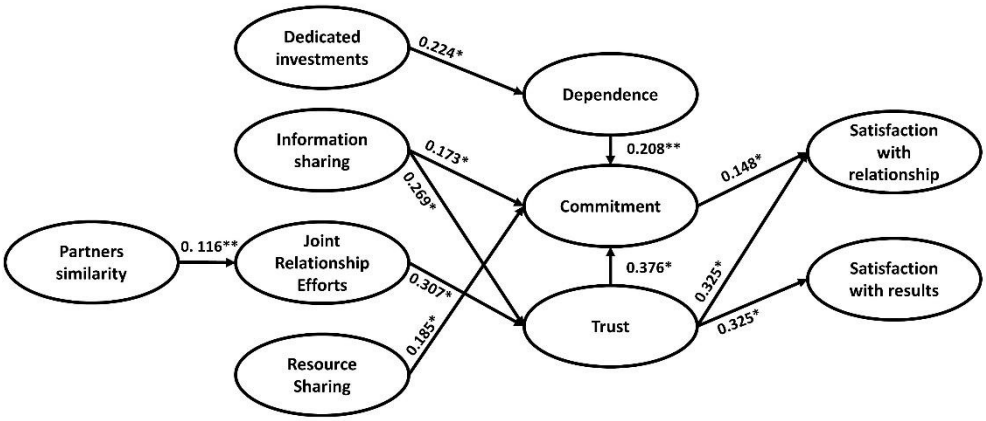

*Figure 4.2: Food sample path model. *: significant at 0.01, **: significant at 0.05*

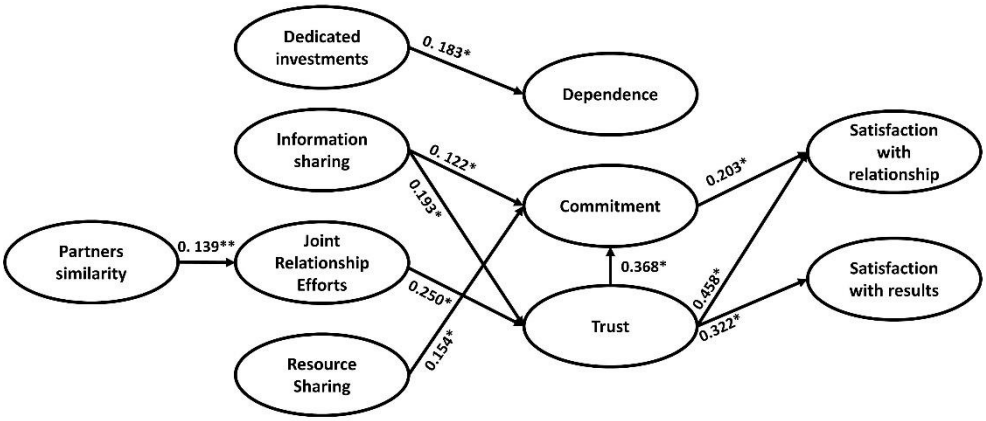

*Figure 4.3: Non-food sample path model. *: significant at 0.01, **: significant at 0.05*

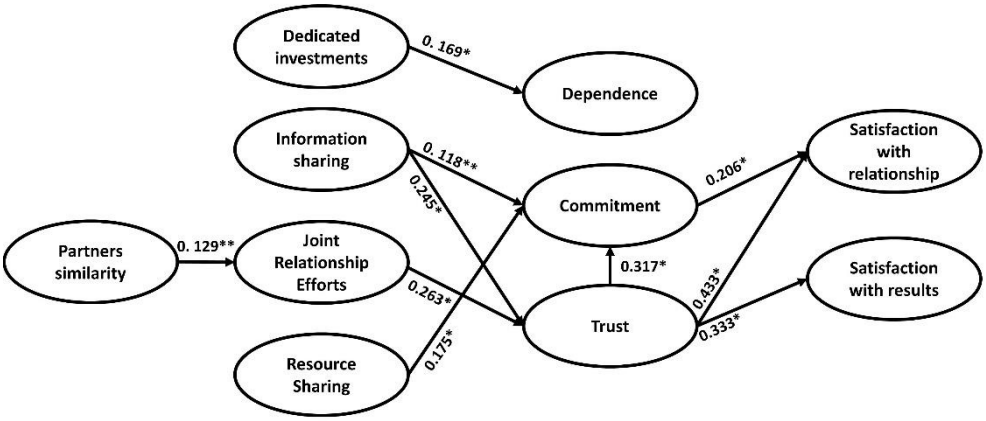

*Figure 4.4: LMLI sample path model. *: significant at 0.01, **: significant at 0.05*

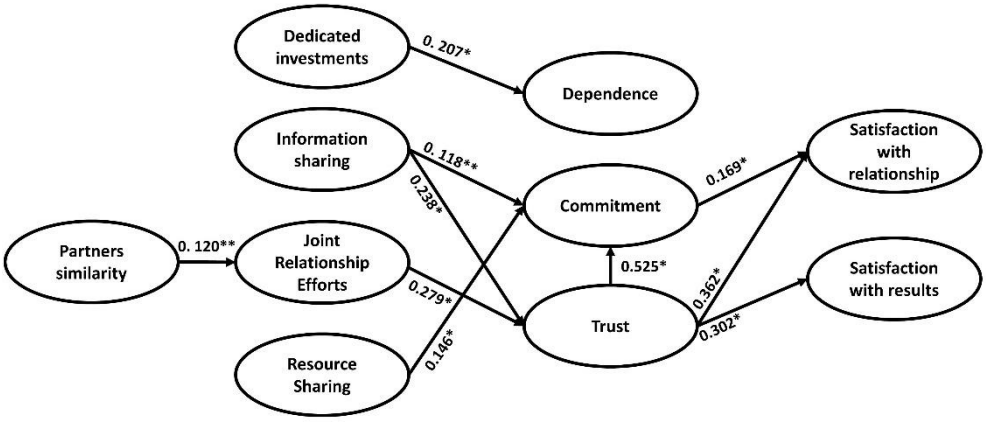

*Figure 4.5: UMHI sample path model. *: significant at 0.01, **: significant at 0.05*

4.5.2.3 Testing for control variables

The structural model fit was also conducted with firm size and respondents' title included as control variables in the model. The results, which are presented in Appendix 6, show that no significant differences emerge from the analysis compared to the models presented above, in which control variables are not taken into consideration. The results show that, with and without the control variables, the significant regressions paths are the same, the invariant paths are the same, and the regression paths values are not significantly different. Table 4.7 shows the values for significant regression paths with and without the presence of control variables. The 90th percentile for the differences in the size of the effects between the models with and without the control variables is located at 0.029 (food samples), 0.019 (non-food sample), 0.016 (LMLI sample), and 0.014 (UMHI sample).

Table 4.7: SEM regression paths with and without the control variables

Significant regression paths	**Model without control variables**				**Model with control variables**			
	Food	Non-Food	LMLI	UMHI	Food	Non-Food	LMLI	UMHI
Dependence → Commitment	0.208				0.208			
Trust → Commitment	0.376	0.368	0.317	0.525	0.371	0.365	0.326	0.502
Trust → Satisfaction with the relationship	0.325	0.458	0.433	0.362	0.354	0.472	0.449	0.374
Trust → Satisfaction with results	0.325	0.322	0.333	0.302	0.343	0.338	0.353	0.316
Dedicated investments → Dependence	0.224	0.183	0.169	0.207	0.202	0.164	0.153	0.195
Resources sharing → Commitment	0.185	0.154	0.175	0.146	0.189	0.159	0.179	0.153
Information sharing → Trust	0.269	0.193	0.245	0.238	0.201	0.277	0.249	0.251
Information sharing → Commitment	0.173	0.122	0.118	0.118	0.174	0.124	0.118	0.120
Joint relationship efforts → Trust	0.307	0.250	0.263	0.279	0.292	0.242	0.251	0.268
Partners' similarity → Joint relationship efforts	0.116	0.139	0.129	0.120	0.126	0.149	0.136	0.130

4.5.2.4 Hypotheses testing results

As shown in the path diagrams, not all the hypotheses are supported, with a high degree of consistency across groups. Regarding the relationship between collaborative activities and the mediating variables, dedicated investment was hypothesized to positively impact dependence, commitment, and trust. While the results show a positive and significant impact of dedicated investments on dependence, its impact on trust (negative) and commitment (positive) was not significant in any sample. Information sharing was hypothesized to have a positive impact on both commitment and trust. These hypotheses were both verified in all samples. Joint relationship efforts were also expected to have a positive impact on trust and commitment. While the relationship between joint relationship efforts and trust was positive and significant in all samples, its relationship with commitment was not supported in any of the samples. In addition, its relationship with commitment was found to be negative in the food sample. Resource sharing was hypothesized to positively impact trust and commitment; however, only the relationship between resource sharing and commitment was significant. Finally, the partners' similarity was found to positively impact joint relationship efforts in all samples.

Concerning the mediating variables, both dependence and trust were hypothesized to have a positive influence on commitment. While the results show a positive and significant impact of trust on commitment, the influence of dependence was only significant in the food sample. Trust was expected to have a positive impact on the respondents' satisfaction with the relationship and with the results. Both hypotheses were supported for all the samples. Commitment was also hypothesized to positively impact the satisfaction with the relationship and with the results. Only the relationship between commitment and satisfaction with the relationship was found to be significant. The hypotheses results are summarized in Table 4.8:

Table 4.8: Hypotheses results

Number	Hypothesized relationship	Food sample	Non-food sample	LMLI sample	UMHI sample
H1	Dependence → Commitment	Supported	Not supported	Not supported	Not supported
H2	Trust → Commitment	Supported	Supported	Supported	Supported
H3a	Trust → Satisfaction with the relationship	Supported	Supported	Supported	Supported
H3b	Trust → Satisfaction with results	Supported	Supported	Supported	Supported
H4a	Commitment → Satisfaction with the relationship	Supported	Supported	Supported	Supported
H4b	Commitment → Satisfaction with results	Not supported	Not supported	Not supported	Not supported
H5a	Dedicated investments → Dependence	Supported	Supported	Supported	Supported
H5b	Dedicated investments → Trust	Not supported	Not supported	Not supported	Not supported
H5c	Dedicated investments → Commitment	Not supported	Not supported	Not supported	Not supported
H6a	Resources sharing → Trust	Not supported	Not supported	Not supported	Not supported
H6b	Resources sharing → Commitment	Supported	Supported	Supported	Supported
H7a	Information sharing → Trust	Supported	Supported	Supported	Supported
H7b	Information sharing → Commitment	Supported	Supported	Supported	Supported
H8a	Joint relationship efforts → Trust	Supported	Supported	Supported	Supported
H8b	Joint relationship efforts → Commitment	Not supported	Not supported	Not supported	Not supported
H9	Partners' similarity → Joint relationship efforts	Supported	Supported	Supported	Supported

4.6 Discussion of the results

The results show that the proposed model has great potential for generalizability as it is supported by samples from different industry and country categories. This result is important as it shows that factors influencing HLC, as well as the relationship between them (i.e. effect size), remain the same across industries. While this observation suggests that partners from different industries and/or countries are expected to behave in a similar way, and consequently develop similar levels of satisfaction, the significant positive effect of partners similarity on joint relationship efforts brings an additional essential element to consider. Indeed, this result shows that firms are more likely to engage in joint relationship efforts when they operate in a similar way and manage products that require similar handling conditions. Thus, the industry membership does not have a major effect on the relationship as long as the partners have similar processes and manage compatible products.

While the results to some extent confirm the insights from previous studies on vertical collaboration enablers, some important differences are noted. First, the non-significant impact of dedicated investments on commitment (H5c) contradicts the existing literature on collaboration (Nyaga et al., 2010). Indeed, dedicated investments are usually a sign of long-term commitment in buyer-seller relationships, as firms try to safeguard their investments by making the necessary efforts for the collaboration to continue. Our results also contradict the findings from Walker et al. (2013) exploratory study on horizontal collaborative procurement, where 16% of the interviewees indicated the existence of a positive relationship between dedicated investments and commitment. While their study mainly focused on investing in human resources, our research measures dedicated investment in terms of physical assets, human resources, and proprietary expertise which may explain the differences in the results. It can also be argued that firms engage in horizontal relationships to have access to complementary resources (Cruijssen, 2006), which may explain the significant impact of resource sharing (H6b) and the non-significant impact of dedicated investments on commitment.

Second, besides the food group, the impact of dependence on commitment (H1) was not significant in any of the other samples. The significant and positive H1 in the food sample can be explained by the fact that AFSCs rely on highly specialized and expensive technical equipment which requires high capacity utilization (Van der Vorst et al., 2011), thus leading to dependence in the relationship and more commitment as a result. The non-significance of H1 in the remaining groups is inconsistent with the findings of previous studies on vertical collaboration. Kalwani and Narayandas (1995), Fynes et al. (2005) and Huo et al., (2015) stipulate that dependence-based relationships, originating from the existence of relationship-specific investments, facilitate collaboration since the partners need to recoup their investments. As a result, they are expected to be more committed to the relationship. As explained the previous paragraph, horizontal collaboration the main motive for firms to engage in horizontal collaboration is not to jointly invest in dedicated assets, but to share tangible and intangible resources, allowing them to reach a competitive advantage. As such, dependence originating from dedicated investments is not relevant for HLC, which in turn can explain its non-significant impact on commitment.

Finally, while commitment has a positive influence on the partners' satisfaction with the relationship, its impact on the satisfaction with the results was not significant, which is not

consistent with the results on vertical collaboration studies. Prahinski and Benton (2004), Jap and Ganesan (2000), and Nyaga et al. (2010) showed that the collaboration results were directly impacted by the partners' level of commitment in the relationship. This indicates that the partners' commitment to the relationship does not necessarily improve their respective performances, or that current operational performance may not directly be attributed to commitment but rather to the joint operational efforts of the partners. In this case, trust represents the main factor positively influencing the satisfaction with the results, as it is directly positively impacted by the operational efforts, i.e. information sharing (H7a) and joint relationship efforts (H8a).

4.6.1 Comparison of the food and non-food models

In addition to testing the formulated hypotheses, one of the main contributions of this research is to compare independent samples illustrating the opinions of food and non-food professionals regarding collaborative relationships. The analysis shows that the sizes of the effects are consistent across the two groups, as shown by the good model fit. The statistically significant paths are also largely similar in both groups, meaning that the set of relationships that influence the satisfaction with collaboration (figure 4.2 and 4.3) are similar for both food and non-food companies.

Nevertheless, the invariance test reveals that the effect of dependence on commitment (H1) is significant in the food sample and non-significant in the non-food sample, as stipulated in section 4.2.2. The significance of H1 in the food sample creates an indirect effect of dedicated investments on commitment. This difference can be explained by the fact that AFSCs are known to rely on expensive specialized technical equipment (e.g. specialized transformation machinery, cool transportation trucks, cool storage facilities…), for which high capacity utilization is necessary (Van der Vorst et al., 2011). This characteristic, combined with the seasonal pattern of food products (Eksoz et al., 2014), represents a major challenge for investing in machinery in AFSCs. Through joint dedicated investments, the partners can ensure an adequate level of capacity utilization of the specialized equipment (Vanovermeire et al., 2013, Soek and Nof, 2014). Investing together in specialized machinery creates dependence in the relationship, which in turn results in more commitment as partners can only recoup their investment through working together.

While comparing the food and non-food models, it comes as a surprise that the impact of partners similarity on joint relationship efforts is invariant across the food and non-food samples. As explained in section 4.2.2, theoretical considerations led us to believe that the strict requirements of food products in terms of transportation and storage conditions, coupled with the strict food safety legislation (Akkerman et al., 2010) increases the importance of product similarity to be able to work together. The empirical results from the case studies presented in Chapter 3 also indicate the importance of partners' similarity for collaboration in AFSCs (Badraoui et al., 2019). Therefore, we expected partners' similarity to have a much higher impact on joint relationship efforts in the food sample.

Inspecting the data reveals that only half of the food sample represents actors that are involved in producing and processing fresh food products with specific transportation and storage conditions in terms of temperature and humidity. Partners' similarity in terms of products is, as presented in section 4.2.2, most important when products require specific temperature and humidity level to ensure their quality and when product interference (e.g bananas secretion of ethylene which ripens other fruits) is present (Van der Vorst *et al*., 2007). This sample distribution may be a reason for the invariant regression paths. To investigate further the existence of an effect because of food characteristics and strict food regulations, we ran an independent-samples t-test on the means of item ps3 *(In this collaboration, the partners manage products that require similar transportation and storage conditions (e.g. temperature, humidity, ...))*. The results show that the means of the two groups are significantly different at 0.05, with the food group scoring on average 8% higher than the non-food group on this specific item.

4.6.2 Comparison of the LMLI and UMHI models

To cover the overall context influence on HLC, a country category comparison has also been undertaken to provide insights into the influence of country characteristics. The study compares independent samples illustrating the opinions of professionals from lower middle low-income and upper middle high-income countries. The results show that the size of the effects is similar in both samples, as shown by the good model fit. The statistically significant paths are similar in both groups, meaning that both samples have consistent perceptions regarding the relationships that influence their satisfaction with collaboration (figure 4.4 and 4.5).

Nevertheless, structural invariance analysis shows that one structural path is significantly different across the two samples. Indeed, the effect of trust on commitment is stronger in UMHI countries compared to LMLI countries. First, this difference can be related to the weak institutional context of low and middle low-income countries (Cai et al., 2010). In sub-section 4.2.2.2, we explain how firms in weak institutional context fear the absence of conflict resolution mechanisms, which reduces trust development and subsequently commitment (Fuglsang and Jagd, 2015). Early studies have demonstrated the impact of the institutional context on the strategies undertaken by industry professionals (e.g. Aldrich and Fiol, 1994). Hagen and Choe (1998) work on interfirm relations shows that the institutional and societal context is largely responsible for the trust level in a relationship. Wicks and Berman (2004) discuss how the institutional environment influences trust creation, which eventually impacts the collaboration results. Hemmert et al. (2016) show that the institutional context, characterised by the power of legal protection and government support, is strongly related to the inter-firm trust-building process. Government support, i.e. institutional commitment to developing collaborative activities, has also been put forward by Mattor and Chen (2015) as an element favouring the development of trust and commitment in collaborative relationships. Cai et al. (2010), which studied supply chain in the case of an emerging country, indicate that weak institutions do not contribute to trust development in interfirm relationships.

Second, the lower impact of commitment on trust in LMLI countries compared UMHI countries may be related to other elements which contribute to trust building in collaborative relationships. The literature on vertical collaboration points to prior interpersonal relationships (Abbad et 2008) and collaborative culture (Zhang and Cao, 2018) as possible factors that influence trust development in developing countries. *Interpersonal relationships*, such Guanxi in China, are important in contexts where trust is low outside family structures (Abbad et al., 2013). Akrout et al. (2016) indicate that interpersonal relationships are a source of stability and promote the development of affective trust. Cai et al. (2010) also point to the importance of interpersonal relationships in building trust, which is shown by their significant direct positive impact on trust. Collaborative culture plays an indirect role in trust development in collaboration. In contexts characterized by a collaborative culture, firms are more inclined to participate in collaborative efforts (Zhang and Cao, 2018), which in turn leads to more trust. Unfortunately, it is not possible to make any statement regarding the

collaborative culture of UMHI countries vs LMLI countries in this study. As explained in the data collection phase, attempting to group the respondents based on their cultural characteristics resulted in unbalanced groups, thus not allowing us to perform a cross-cultural comparison.

4.7 Managerial and theoretical implications

4.7.1 Managerial implications

This research shows that opinions of companies operating in different industries and located in different countries on HLC enablers are generally more similar than they are different. This result, in and of itself, is interesting because it opens the door for global and interdisciplinary collaborations experiences. The highly similar output of the different models implies that, in general, operational actions taken by the partners to increase trust and commitment will lead to greater collaboration benefits. The consistent significant positive impact of information sharing on trust and commitment across the samples indicates that facilitating information exchange (though ICT for instance) will result in better collaboration benefits. This is consistent with previous research on vertical collaboration identifying information sharing as a key element for the success of collaborative relationships (Fawcett et al., 2015). The significant positive influence of joint relationship efforts on trust, and not on commitment, provides a clear indication to managers that their actions define their trustworthiness, which impacts their partners' satisfaction with the collaboration. This result is also consistent with the findings from vertical collaboration, where joint efforts are not seen as strategic actions defining commitment, but rather as operational actions building trust (Nyaga et al., 2010). The non-significant influence of dedicated investments and the significant influence of resource sharing is an indication that a firm’s motivation to collaborate horizontally is the access to complementary resources rather than joint investments.

The conducted research also leads to specific contextual managerial implications. First, the research highlights the impact of AFSCs characteristics on horizontal collaboration. The impact of dedicated investments on commitment, although indirect, was only significant in the food sample, which is explained by the expensive and specialized nature of food production, processing, and distribution equipment. This same characteristic also increases the importance of resources sharing within the collaboration to increase the capacity

utilization of the specialized equipment. Although not statistically significantly different, the size of the effect of resource sharing on commitment was 20% higher in the food sample. The results also show that information sharing and joint relationship efforts have a higher impact on trust and commitment in the food sample, which can be attributed to the specific requirement of food products (temperature, humidity), their perishable nature, and the need to comply with strict food safety regulations. Situating these results in the theoretical context of collaboration is rather complex because, to the best of our knowledge, there are no studies that compare factors influencing collaborative outcomes in different industries.

Second, managers should be aware of how their activities influence collaboration outcomes. Indeed, the research shows that trusting partners are more likely to commit to the relationship in UMHI countries, whereas trusting partners are more likely to be satisfied with the relationship in LMLI countries. If the operational activities building trust, i.e. information and joint relationship efforts, remain the same in both contexts, they influence the collaboration outcomes in different ways. In LMLI countries, managers should be aware that the institutional context limits the partners' commitment to the relationship (Fuglsang and Jagd, 2015), which is an essential element influencing the collaboration outcomes. Because this feeling results from the partners lack of trust in the institutions' ability to resolve conflicts, the partners should work on developing internal conflict resolutions mechanisms, which have been identified as potential success factors for HLC (Abbad, 2008). The partners can also make use of relational governance mechanisms to promote trust and commitment in the relationship, such as the development of interpersonal relationships (Cai et al., 2010).

Finally, a key element for the success of horizontal collaboration remains the similarity between the partners. Although firms' opinions regarding collaboration factors generally concur, partner similarity was found to have an impact on joint relationship efforts. In other words, for companies to be able to work together, they need to share a certain degree of similarity in terms of the technology and equipment they use, as well as in terms of the conditions under which their products are processed, stored, and distributed.

4.7.2 Theoretical implications

The results obtained in this research have a certain number of implications on theory. First, understanding similarities and differences between different contexts elucidate the role context plays in horizontal collaboration relationships and contribute to their success. In

contrast with the observation made by Saenz et al. (2015), according to which collaborating firms can find different HLC drivers and barriers under various context, our research shows that the factors influencing collaboration outcomes are more similar than they differ under various industry and country categories. The literature on vertical collaboration may point to situations where context influences the collaboration outcomes (Matopoulos et al.,2007; Flynn et al., 2010; Van der Vaart et al., 2012; Rossi et al., 2013), but such results can, for instance, be related to the availability of adequate infrastructure (Reaidy et al., 2015) and skilled labour (Ansell and Gash, 2008) which facilitate the execution of collaborative activities. What our research shows is that the set of relationships that lead to collaboration outcomes are the same in different contexts.

Second, the conducted research also answers the call of Dania et al. (2018) for the need to investigate how collaboration factors function in influencing collaboration activities and outcomes in AFSCs. According to the authors, the interplay between the factors and their impact on the collaboration outcomes may be affected by the AFSCs characteristics. The results of our research confirm this premise, with AFSCs requirements in terms of specialised equipment creating a dependence that leads to commitment, which was only observed in the food sample.

Finally, this research confirms that the factors influencing collaborative outcomes are largely similar between horizontal and vertical collaboration. This research also confirms that the influence structure is similar, in the sense that collaborative activities influence the collaboration outcomes through relational constructs. In investigating Horizontal Logistics Collaboration, several recent studies point to the fact that the literature on HLC is limited and that insights from vertical relationships can be applied (Martin et al., 2018, Basso et al., 2019). This research confirms that premise, and also points to a few notable differences between the two strategies. The first contribution to the existing theoretical base is that horizontal collaboration relationships do not necessarily rely on dedicated investments, but rather on resource sharing. In contrast with findings from vertical collaboration, in which partners tend to make dedicated investments to realize greater returns or secure critical future resources (Nyaga et al., 2010), the focus of horizontal collaboration is on sharing complementary resources in order to increase their utilisation rate (Soek and Nof, 2014). The second contribution is relative to the importance of partners' similarity in terms of processes and products in HLC. While vertical collaboration literature points to the need for size

similarity to ensure a power balance in the relationship, the fact that partners jointly execute operational activities in HLC requires a considerable level of product and process similarity between them (Schotanus et al., 2010, Pan, 2010). The consistent significant positive impact of partners' similarity on joint relationship efforts across industry and country categories is proof of its importance for HLC.

4.8 Future research and limitations

This research hints at several areas where future contributions would be relevant. First, given that collaborative relationships span over a long period, they are likely to go through a life cycle where the relationship between the different constructs in our model might change. As such, performing a longitudinal study of HLC may reveal insights that were not captured by our study. For instance, on one hand, this research shows that the level of trust and commitment is positively influenced by collaborative efforts. On the other hand, we believe that partners are more likely to perform collaborative activities if they trust each other more. This dynamic process, which can be best captured by studying dyads on a long-time span, might result in different models in each phase of the relationship. Second, future research can also further study the moderating effect of culture on horizontal collaboration. Following the approach of Zhang and Cao (2018), cultural dimensions such as collectivism, long-term orientation, power symmetry, and uncertainty avoidance can be measured and included in the model. Finally, future contributions can test whether perceptions become reality in horizontal collaboration by comparing non-collaborating firms' perceptions and collaborating firms' opinions about the factors influencing their satisfaction with the collaboration.

Chapter 5 - Horizontal Logistics Collaboration Success Factors: A Comparative study between Expectations and Reality

This chapter is based on:

Badraoui, I., van der Lans, I., Boulaksil, Y., van der Vorst, J.G.A.J. Intentions versus Actual Actions in Horizontal Logistics Collaboration. *Submitted to an international scientific journal*

In this chapter, we investigate RO3:

To examine the similarities and differences between industry professionals' expectations and actual opinion towards HLC (a) and identify which collaboration barriers limit collaborative behaviour (b).

Abstract

The literature shows that successful implementation of HLC relationships highly depends on understanding the factors that promote and hinder the development of collaborative behaviour. In this chapter, we first compare industry professionals' expectation and opinions with regards to HLC's success factors using two independent samples. The first sample consists of professionals who have never been involved in a collaboration experience but who are willing to collaborate in the future, whereas the second sample consists of professionals who are or have been involved in a collaboration. Second, the identified differences are further investigated using the Delphi method, which allows us to identify underlying limiting factors for HLC. The results show that collaborating professionals engage less in joint relationship efforts and exhibit less trust than the expectation of non-collaborating ones. Reasons behind these differences are primarily associated with inadequate information sharing, poor collaboration formalization, and the absence of costs and benefits allocation mechanisms.

5.1 Introduction

In the last decades, firms have come to realize that achieving competitive advantages and ensuring sustained development transcends their internal capacities and requires the development of close relationships with other firms on the market. In this regard, horizontal Logistics Collaboration (HLC) has gained much consideration in recent years (Martin et al., 2018). HLC refers to the situation where two or more firms, operating on the same supply chain level, collaborate on logistics activities to reach mutual goals (Saenz et al., 2015). Despite the enthusiasm surrounding horizontal collaboration, only a few successful cases are reported in the literature (Basso et al., 2019). In this chapter, we aim to understand why the enthusiasm around HLC does not translate into successful experiences by analysing practical issues the partners face when trying to implement it.

In theory, Horizontal Logistics Collaboration can lead to many benefits, mainly in terms of cost and environmental impact reduction (Basso, 2019). Several Operations Research based contributions have quantified these benefits in a variety of contexts. Soysal et al., (2018) show that horizontal collaboration among suppliers in fresh food chains reduces the total cost by 17% and the total CO2 emissions by 29%. Vanovermeire et al., (2014) show that cost reductions between 10% and 30% can be achieved through horizontal collaboration for three large fast-moving consumer goods companies in Belgium. Cruijssen (2006) shows that saving of about 30% in the total distribution costs can be achieved through joint route planning. Frisk et al. (2010) work on collaborative transportation between 8 Swedish companies in the forest industry indicates that a decrease of 14.2% of in transportation cost and 20% in CO2 emissions could be reached. These results highlight the importance of HLC and strengthen its position as a practice that can potentially improve collaborating firms' performance.

In practice, reaching the expected benefits remains a challenge (Fawcett et al., 2015; Basso et al., 2019). Diverse reasons behind collaboration failures have been advanced (Park and Ugson, 2001; Fawcett et al., 2008b; Walker et al., 2013; Fawcett et al., 2015), answering the call of Dyer and Sigh (1998) asking researchers to examine in detail which factors prevent companies from reaching the collaboration objectives. Examples of issues that have a negative impact of the collaboration chances to succeed are the lack of trust and commitment between partners, the aversion to sharing information, the resistance to engage in

collaborative efforts, and the complexity of the collaborative strategies coupled with the lack of collaborative skills (Walker et al., 2013, Fawcett et al., 2015). Nevertheless, the literature lacks contributions that link the collaboration resistors and enablers in a way that can lead to the creation of an integrative theory of collaboration. Linking collaboration resistors and enablers would "*help assure that more companies migrate from the vicious cycle of entrenched resistance to the virtuous cycle of relational advantages*" (Fawcett et al., 2015). By identifying which collaboration enablers fail in practice and investigating the resistors responsible for it, our research contributes to the development of an integrated theory of collaboration and answers Fawcett et al. (2015) call for deeper insights into the collaboration resistors.

Given the apparent contrast between the overall enthusiasm around collaboration and its limited success rate, the objective of this chapter is to compare collaborating and non-collaborating professionals' opinions with respect to horizontal logistics collaboration (HLC) success factors. This approach is motivated by the fact that, in operations management in general (Croson et al., 2013) and in supply chain management more specifically (Fawcett and Magnan, 2002), industry professionals' actual actions deviate from what should be done despite their intention to follow what theory stipulates. The research design comprises two steps. First, based on survey data, we investigate the similarities and differences between the two groups with respect to HLC success factors. Second, we examine the collaboration resistors responsible for the observed differences by conducting a Delphi study. The aim is to first identify the success factors which status in real collaboration experiences differs from the expectations of non-collaborating professionals and then investigate the collaboration resistors responsible for this situation. Two main contributions are valued in this article. First, we highlight the differences between the expectations of non-collaborating professionals and the reality of collaboration experiences with regards to HLC success factors. Second, we identify practical issues limiting collaborative behaviour, providing industry professionals with a set of barriers that should be addressed for a successful implementation of HLC.

In the next section, the literature on interfirm collaboration is reviewed and HLC success factors are identified. Next, in sections 5.3, the research methodology is described, including instrument development, data collection, and data analysis methods. Then, the results of the paper are presented and discussed in sections 5.4 and 5.5. Finally, the research implications, as well as its limitations, are provided in sections 5.6 and 5.7.

5.2 Theoretical foundations for HLC success factors

Given the scare literature on HLC enablers (Martin et al., 2018), potential success factors for horizontal collaboration can be derived from the abundant literature on vertical collaboration. In this chapter, we build our list of potential success factors on the results obtained from the analysis conducted in Chapter 4. Indeed, the initial literature review conducted in Section 4.2 allowed us to come up with a list of operational and relational collaboration enablers, namely *inter-organizational trust, commitment, dependence, dedicated investments and resources sharing, information sharing, partners, and similarity joint relationship efforts (which gathers goal congruence, incentives alignment, mutual planning and execution of activities, and joint performance measurement)*. Besides dependence, which impact was only significant in AFSCs, the impact of the other factors on the collaboration outcomes (measured in terms of the partners' satisfaction) was empirically confirmed in different country and industry contexts. Therefore, we retain *trust, commitment, dedicated investments, resource sharing, information sharing, partners similarity, and joint relationship efforts* as potential success factors for HLC in this chapter. In the next subsections, we discuss each of these factors expected positive impact on the collaboration outcomes.

5.2.1 Interorganizational trust

The literature on inter-organizational relationships considers trust as perhaps the most important collaboration enabler. Trust reflects the degree to which a firm believes its partners have the skills as well as the intention to meet their obligations (Nyaga et al., 2010). The importance of trust in collaborative relationships is claimed by the Transaction Cost Economics theory, in the sense that it helps mitigate each of its behavioural risks' assumptions regarding opportunism and bounded rationality (Chiles and McMackin, 1996). Trust also contributes to reducing transaction costs relative to monitoring, control, and contractual agreements (Park and Ungson, 1997).

The positive influence of competence and goodwill trust on the collaboration success has been confirmed by several empirical studies (Badraoui et al., 2019; Kwon and Suh, 2004; Fynes et al., 2005, Nollet and Beaulieu, 2005; Vangen and Huxham, 2003), which consider it as a relational governance mechanism that promotes non-enforced collaboration. In other words, trust provides strong foundations for the partners to share information, make dedicated

investments, share resources, and engage in joint efforts. For these reasons, we retain trust as an important success factor for HLC.

5.2.2 Commitment

Commitment refers to the situation where the group members believe that the relationship is important enough to make sure it endures (Morgan and Hunt, 1994). Reasoning from the perspective of the Social Exchange Theory (Blau, 1964), commitment results in performance improvement for the group since the collaborating partners as more likely to engage in collaborative efforts when they are committed to the relationship (Krause et al., 2007). However, collaborative behaviour can only occur when all the group members are committed to the relationship. If one group member exhibits low commitment, this may negatively impact the commitment of other members (Schotanus et al., 2010). Empirical studies have demonstrated the positive impact of commitment on the collaboration outcomes. Prahinski and Benton (2004) showed that collaboration performance was directly impacted by the partners' level of commitment. Jap and Ganesan (2000) found that partners commitment influenced their performance and satisfaction with the relationship. Nyaga et al. (2010) work on buyer-supplier relationship shows that commitment had a direct positive impact on the collaboration performance, as well as on the partners' satisfaction with the relationship. Based on the theoretical and empirical evidence presented above, we identify commitment as an important success factor for HLC.

5.2.3 Dedicated investments and resource sharing

Dedicated investments are investments made by the partners for the specific needs of the relationship. They enable the partners to capture higher returns from the relationship and achieve competitive advantages (Whipple and Russell, 2007). Dedicated investments are generally associated with collaboration success (Nyaga et al., 2010). They offer tangible evidence of the partners' engagement and intentions in the relationship and are thus believed to contribute to the success of collaborative relationships (Rokkan et al., 2003). More specifically, dedicated investments are associated with greater commitment in the relationship as a result of the partners' wish to safeguard their investments (Jap and Ganesan, 2000; Know and Suh, 2004). Dedicated investments also contribute to building commitment by increase the partners dependence in the relationship. According to Heide and John (1998),

firms that invest in the specific needs of the collaboration tend to bond more closely to their partners to safeguard their investments.

Proofs of the partner' involvement and dedication to the relationship can also be identified through *sharing existing complementary resources* (Walker et al., 2013). In the extended resource-based view (Lavie, 2006), resource sharing enables the partners to achieve a competitive advantage. The numerous contributions on industry clusters and networks in an example of the importance of resource sharing in vertical collaboration (Cao and Zhang, 2011). Shared resources include physical resources such as transportation, storage, and manufacturing equipment (Harland et al., 2004). In horizontal collaboration, the partners may share physical resources as well as human resources (Walker et al., 2013). Mutual use of physical resources contributes to increasing their utilization rate while sharing human resources provides complementary skills and expertise to the partners. In the two case studies reported in Chapter 3, sharing complimentary resources (personnel and the first case, trucks and storage facilities in the second case) has also been identified as having a positive influence on trust and commitment, which in turn increase the collaboration chances to succeed (Badraoui et al., 2019). Hence, we identify dedicated investment and resource sharing in physical assets and human resources as potential success factors for HLC.

5.2.4 Information sharing

Supply chain collaboration represents a dynamic process involving the continuous flow of information between the partner (Hudnurkar et al., 2014). *Information sharing* is defined as the act of exchanging accurate, complete and relevant information between the partners (Cao and Zhang, 2011). It plays a fundamental role in enabling collaborative efforts by reducing information asymmetry and facilitating accurate planning and execution of activities (Vereecke and Muylle, 2006). As such, it contributes to collaborative activities synchronization and helps avoid opportunity cost relative to sub-optimizations (Cruijssen, 2006). Information sharing is also argued to be essential for trust and commitment building in a relationship as it helps partners better understand each other's processes, thus contributing to achieving collaborative benefits and increasing the collaboration chances to succeed (Zhang and Cao, 2018).

Empirical studies have demonstrated the positive impact of information sharing on the collaboration outcomes. Hoegl and Wagener (2005) show that the frequency and intensity of

information exchange have a significant positive influence on collaboration performance. Festus and Xiaoming (2010) work showed a direct positive impact of information sharing on collaboration on reverse logistics activities. Panahifar et al. (2018) also showed that information sharing has a direct positive impact on collaboration effectiveness, and subsequently the firm's performance. In comparing buyers and suppliers' opinions regarding supply chain collaboration antecedent, Nyaga et al. (2010) showed that information sharing had a direct positive impact on trust and commitment, which in turn have a positive impact on the collaboration outcomes.

In light of the discussion above, we retain information sharing as a success factor for HLC and consider information quality, completeness and timeliness as indicators of information sharing.

5.2.5 Joint relationship efforts

Joint relationship efforts represent several actions through which partners plan activities and synchronize decisions in the collaboration (Nyaga et al., 2010). These actions include *setting up common objectives, decision synchronization, joint planning*, *joint performance measurement,* and *incentives alignment* (Min et al., 2005; Walker et al., 2013). First, *setting up common objectives*, which consist of moving from individual sub-optimizations to overall goals for the collaboration (Cao and Zhang, 2011), is believed to decrease transaction costs as less fine-tuning and adaptation is needed (Schotanus et al., 2010). Considerable differences in the partners' objectives may result in diverging collaborative actions and eventually in tensions between the collaborating partners (Laing and Cotton, 1997). Second, *joint planning and decisions synchronization* represent key activities through which the partners ensure a successful implementation of collaborative actions (Zhang and Cao, 2018). Even though systematic agreements on decisions reduce the partner's flexibility and may result in higher bargaining and enforcement costs, these agreements reduce the emergence of conflicts and mitigate the uncertainty in the relationship (Schtanus et al., 2010). Third, periodically reporting about the collaboration performance has become a standard in collaborative relationships (Fawcett et al.,2008). It contributes to the reduction of misunderstandings regarding the state of the collaboration and allows the partners to identify problems before they become constraining. Finally, joint efforts also include aligning incentives, i.e. agreeing on a costs and benefits allocation mechanism perceived as fair by the partners. Firms engage in collaborative efforts in the search for financial savings, which if attained, should be fairly

allocated to the collaborating partners (Wagner and Lindemann, 2008). An allocation mechanism perceived as unfair may lead to lower commitment levels and have a negative impact on collaboration success.

Therefore, we consider joint relationship efforts, including *goal congruence*, *decision synchronization, joint planning, joint performance measurement,* and *incentives alignment*, as a success factor for HLC.

5.2.6 Partners similarity

Through HLC, partners have the possibility to complement each other through contributing with knowledge and assets, as well as by reducing duplication of efforts. However, efficient joint efforts necessitate a certain level of similarity and uniformity between partners in terms of internal processes and organizational culture (Polychronakis and Syntetos, 2007), products requirement in terms of logistics equipment, and product requirement in terms of transportation and storage conditions (Pan, 2010). In terms of internal processes, it is argued that transaction costs are lower between similar members as the need for adaptation is reduced (Schotanus et al., 2010). Regarding product similarity, it facilitates the execution of operational activities and increases the possibility to use already existing infrastructure (Pan, 2010). Partners similarity also contributes to reducing the risk that the partners develop different perceptions of the value each one brings to the relationship (Schotanus et al., 2010). In the case studies reported in Chapter 3, partners similarity in terms of purchasing and manufacturing processes facilitated the execution of collaborative activities in the first case. In the second case, the similarity in terms of products requirements allowed the partners in the second case to use existing transportation equipment and storage facilities (Badraoui et al., 2019. Therefore, based on the discussion above, we retain partners similarity as a success factor for Horizontal Logistics Collaboration.

Having discussed the potential success factors for Horizontal Logistics Collaboration and given the apparent contrast between the overall enthusiasm regarding HLC and its low success rate, we expect to find differences between the opinions of non-collaborating industry professionals HLC success factors and the feedback of the collaborating ones. In other words, how professionals think HLC should be managed might differ from what is done in reality. In this regard, we formulate the following general proposition for this chapter: ***The mean***

scores of HLC success factors is higher in the non-collaborating group compared to the collaborating group.

5.3 Instrument development, data collection, and data analysis method

In this section, we present the research methodology followed in this paper, including instrument development, data collection, and data analysis method. The methodology consists of two steps. The first step, which is presented in section 3.1, involves the measurement and comparison of the identified HLC success factors from the perspective of collaborating and non-collaborating industry professionals. Through this analysis, will allow us to identify the factors for which differences exist between the expectations of non-collaborating professionals on how the collaboration should work and the opinions of collaborating professionals based on real collaboration experiences.

The second step, which is presented in section 3.2, concerns the identification of possible collaboration barriers that can explain the observed differences in the first part of the analysis. The use of the Delphi methodology allows collaborating professionals to reflect on the observed differences and their possible causes based on their own experience with HLC.

5.3.1 Step1: Measuring collaboration success factors

The data collection and analysis used to measure and compare collaboration success factors follows the same methodology as described in sections 4.3 and 4.4 in Chapter 4. The same data set is used to compare collaborating professional (sample size = 138) and non-collaborating professional responses (sample size = 206). Splitting the sample into collaborating and non-collaboration respondents is based on Question 6 Appendix 2, where the respondents were asked to choose whether they “are currently collaborating”, “have collaborated in the past”, “have never collaborated”. Respondents who are currently collaborating or have collaborated in the past were considered as collaborating professionals, while respondents who have never collaborated were considered as non-collaboration professionals. The respondents were given instruction on how to answer the questionnaire in each of these situations. In case the respondents are currently collaborating or have collaborated in the past, they were asked to answer questions 6 to 31 based on the actual state of the collaboration or the last known stage respectively. In case the respondents have never been involved in a horizontal collaboration experience, but wish to start one in the near future,

they were asked to skip to Question 32 and answer the subsequent questions based on their opinion on how the collaboration should work.

Similar steps were undertaken to check the constructs unidimensionality, validity, and reliability. Furthermore, the same methods were followed to test for common method bias and conduct the measurement invariance procedure. In addition to the above-described methods, we also perform two-independent samples t-test to compare the mean values of the items used to measure HLC success factors.

5.3.2 Step2: Identifying collaboration barriers

The data collection and analysis used to examine the reasons behind the differences between the collaborating and non-collaborating samples followed the Delphi three-phase process described by Okoli and Pawlowski (2004) (see Figure 5.1). The targeted respondents were professionals who are or were involved in a collaboration experience, participated in the success factors measurement survey (Step 1), and agreed to provide their contact information for any further inquiry. An invitation to take part in the Delphi study was sent to 50 industry professionals in total, from which 10 expressed their interest in participating as a panellist. The panellists operate in different industries (AFSC, Manufacturing and assembly, and transportation & logistics), and holding different positions within their firms (director, logistics manager, or production manager), providing enough diversity of opinions while remaining within a manageable size (Schmidt et al., 2001). The surveys used in this part of the study are provided in Appendix 3.

The first phase, referred to as the brainstorming phase, consisted of asking the panel members to provide a list of potential reasons that can explain the observed differences. The lists from the respondents were consolidated, exact duplicates removed, and the terminology unified. In the case of differently formulated reasons, the unification decision was based on the meaning conveyed by the panellist explanation. The consolidated list was then sent back to the panellists to confirm that, after terminology unification, the full list of the reasons they initially provided was still represented.

The second phase consisted of narrowing down the list of reasons to only include those that are perceived as important. A maximum of 20 elements was suggested by Schmidt (1997) as a manageable number that could be meaningfully ranked. As such, instead of forcing the size of the list, the respondents were asked to choose at least 10 elements from the consolidated

list that they deemed to be the most important. At the end of the second phase, only the reasons that were chosen by more than 50% of the respondents were retained. Through this simple majority vote process, it was possible to reduce the list to a manageable and easy-to-rank size that reflects the majority opinion regarding the importance of each formulated reason in explaining the observed differences. Before moving to the ranking phase, and in order to develop an initial idea about the level of agreement between the panellists on the chosen elements, we calculated the *Fleiss' kappa (*κ) for multiple ratters (Fleiss and Cohen, 1973), which indicates slight ($0.01<\kappa<0.2$), fair ($0.21<\kappa<0.4$), moderate ($0.41<\kappa<0.6$), substantial ($0.61<\kappa<0.8$), and almost perfect ($0.81<\kappa<1.0$) agreement.

The third phase consisted of ranking the retained barriers in decreasing order of importance. The consensus among the panellists ranking was tested using Kendall's W coefficient of concordance, for which values above 0.7 indicate strong agreement on the ranking Schmidt (1997). Two ranking rounds were conducted before reaching an acceptable level of consensus. To avoid any bias in the ranking, the list of reasons retained in the second phase was presented in different random order for each panellist.

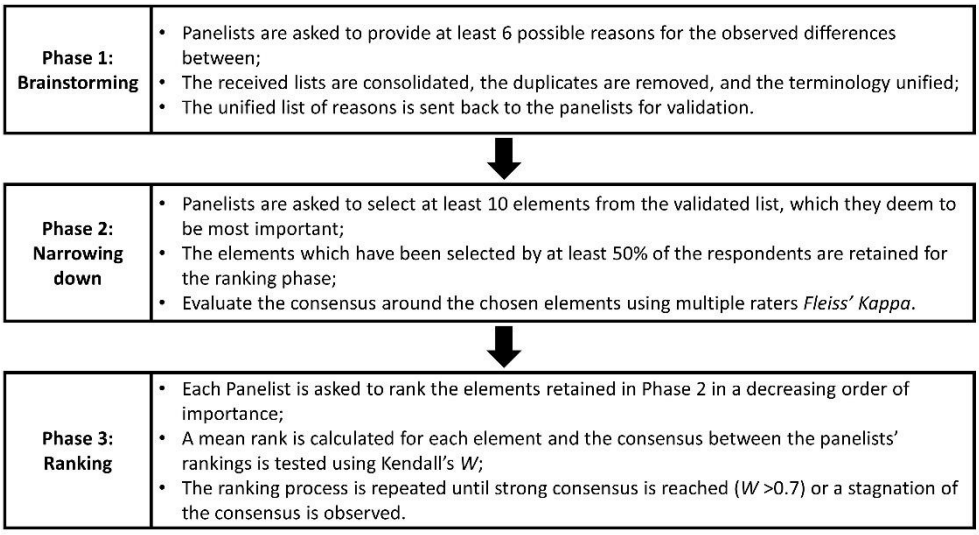

Figure 5.1: Description of the Delphi study process

5.4 Survey results

5.4.1 Multigroup comparison

5.4.1.1 Scale properties per sample

A multi-factor model including all constructs was specified in LAVAAN and tested collaborating and non-collaborating professionals. After iteratively dropping items with (completely standardized) loadings lower than 0.5, the final model consisted of 21 items for 7 constructs (Table 5.1). Regarding the "Non-collaborating" sample, the fitted multi-factor model shows a good fit (Hooper et al., 2008), meaning construct validity is achieved: CFI = 0.944 (>0.9), NNFI = 0.930 (>0.9), RMSEA = 0.055 (<0.08), and normed chi-square = 1.63 (<2.0). All item loadings meet the recommended values and are significant at α=0.01, indicating unidimensionality and convergent validity. Also, all constructs show good convergent validity with AVE values greater than the recommended cut-off value of 0.5. As of discriminant validity, the AVE of each construct is compared to its shared variance with the other constructs (Fornell and Larcker, 1981). The AVE values, which range between 55% and 68%, are larger than the squared intercorrelations for each construct in the sample, indicating good discriminant validity. Finally, the constructs internal and composite reliabilities are sufficient, as both Cronbach's α's, and ρ_c values are above 0.7.

Concerning the "Collaborating" sample, all items loadings are significant at α=0.01 and meet the recommended values. An exception is noted for the first partner-similarity item (ps1), which loading is below 0.5 (0.445). Simply removing this item from the list results in a model identification problem. As such, we fitted an alternative multifactor model in which ps1 is removed and the loadings of ps2 and ps3 are fixed to the same values found in the initial model. The alternative model results in a non-significant decrease in chi-square (p-value = 0.28), and a negligible change in fit indices (<0.001). Therefore, we decided to keep the ps1 in the list of items used in this study. The fitted multifactor model shows a good fit, indicating that construct validity is achieved: CFI = 0.961 (>0.95), NNFI=951 (>0.95), RMSEA = 0.054 (<0.08), and normed chi-square = 1.4 (<2.0). All the constructs in the model show good convergent validity, with AVE values greater than 0.5. Regarding discriminant validity, the AVE values (which range from 56% to 80%), are larger than the squared intercorrelations for each construct. Finally, the constructs internal and composite reliabilities are sufficient, as both Cronbach's α's, and ρ_c values are above 0.7.

Table 5.1: Constructs reliability measures and factor loadings

Survey Items:	Collaborating				Non-Collaborating			
	Loadings	**AVE**	**CR**	**Cronbach α**	**Loadings**	**AVE**	**CR**	**Cronbach α**
Information sharing								
is2	0.762				0.825			
is3	0.933	0.69	0.87	0.857	0.857	0.62	0.83	0.817
is4	0.783				0.665			
Joint Relationship Efforts								
jre1	0.701				0.643			
jre3	0.886	0.65	0.85	0.837	0.877	0.62	0.83	0.822
jre4	0.816				0.829			
Dedicated Investments								
dedinv1	0.820				0.701			
dedinv2	0.755	0.56	0.79	0.783	0.789	0.57	0.80	0.796
dedinv3	0.652				0.769			
Resource Sharing								
rs1	0.973				0.898			
rs2	0.884	0.79	0.92	0.908	0.925	0.68	0.86	0.850
rs3	0.793				0.617			
Partners Similarity								
ps1	0.445				0.560			
ps2	0.964	0.59	0.80	0.764	0.889	0.55	0.78	0.758
ps3	0.796				0.734			
COMMITMENT								
com1	0.869				0.838			
com2	0.943	0.80	0.92	0.919	0.887	0.66	0.85	0.843
com3	0.868				0.690			
TRUST								
tr1	0.925				0.807			
tr2	0.945	0.76	0.90	0.896	0.854	0.60	0.81	0.804
tr3	0.729				0.640			

(AVE: Average variance extracted, CR: Composite reliability)

5.4.1.2 Testing for common method bias

Collecting data using the same types of questions raises concerns regarding common method bias (CMB). The Harman's single-factor test (Podsakoff et al., 2003), which consists of a

principal components analysis on the whole sample, reveals that the first principal component accounts for only 24.7% of the total variance (compared to 76.5% that is accounted for when taking as many principal components as the number of constructs), indicating that CMB is not a major problem in the data. This conclusion was further confirmed by adding a common latent factor (CLF) to the multi-factor CFA model, with the latter being uncorrelated with the other model factors. Comparing the model without and the model with the CLF on the whole sample revealed negligible decreases in item loadings, with a mean value of 0.017 and the 90^{th} percentile located at 0.048. This result further confirms that common method bias is not a major issue in the data.

5.4.1.3 Assessing measurement invariance

A two-group measurement invariance test was performed across the collaborating and non-collaborating samples to check whether the constructs are measured the same way across the samples (see Table 5.2). Configural invariance is achieved as the two multifactor models show good fit (also, see section 5.1.1). Second, we tested for metric invariance through imposing an equality constraint on the factor loadings across groups. The results reported in Table 3 show that this model also exhibits good fit. In comparison with the configural model, the changes in CFI and RMSEA (ΔCFI and ΔRMSEA) are lower than 0.01, thus showing good metric invariance. Third, we performed a scalar invariance test by constraining the item intercepts to be equal across groups as well. The results indicate that scalar invariance is achieved as (i) the fit indices show a good model fit, and (ii) the ΔCFI and ΔRMSEA are lower than 0.01 in comparison with the metric invariance model. Fourth, we conducted a full strict invariance test through constraining measurement errors to be equal across groups. Table 3 shows that this model also has an acceptable model fit indices but results in a ΔCFI higher than 0.01 compared with the scalar invariance model, suggesting that some measurement errors differ across the two samples. As such, successive models where each pair of residuals was freed at a time were tested to improve the model fit. The results indicate that, by allowing four residuals to vary across the two groups, partial invariance is achieved. The residuals are relative to the items for *joint relationship efforts* (jre1, jre4), *trust* (tr2), and *dedicated investments* (dedinv3). The partial strict invariance model shows a good model fit and results in acceptable (<0.01) changes in CFI and RMSEA.

Table 5.2: measurement invariance test results

Model	X^2 (df)	p-value	CFI	RMSEA	Change CFI	Change in RMSEA
Configural invariance	510.34 (336)		0.952	0.055	n/a	n/a
Metric Invariance	530.91 (350)	0.11	0.950	0.055	0.002	0.000
Scalar Invariance	550.98 (364)	0.13	0.949	0.055	0.002	0.000
Full strict invariance	679.21 (385) *	<0.001	0.919	0.067	0.029	0.012
Partial strict invariance	598.96 (381) *	<0.001	0.940	0.058	0.009	0.003
Factors means invariance	621.44 (388) *	0.002	0.936	0.059	0.004	0.001

(*): significantly different chi-square from the previous model

Finally, we tested for significant differences in factors' means. The results show that 2 out of 7 constructs have significantly different means across the two samples. Compared to the non-collaborating sample, the collaborating sample appears to have significantly lower factor means for joint relationship efforts (Δmean = -0.429; p-value < 0.001) and trust (Δmean = -0.218; p-value = 0.043). This observation is further confirmed by running independent samples t-test on the joint relationship efforts and trust measuring items. Concerning joint relation efforts, the test shows that the three items (jre1: having joint teams, jre3: conducting joint planning, and jre4: making joint decisions) have significantly different mean values, with the non-collaborating group scoring 18.1%, 13.3%, and 12.5% higher on each item respectively (Figure 5.2). Two additional items that were used to measure joint relationship efforts but were not retained in the CFA model because of low loadings, namely jre2 (sharing common objectives) and jre5 (Performing regular joint performance measurement), also show significantly different means across the two groups (the intentions group scoring 36% and 12% higher respectively on each item).

Regarding trust, two of the three items used in the CFA model show significantly different means across the two groups (tr1: partner being qualified to fulfil their obligations, tr2: partners having the skills to increase the collaboration performance), with the non-collaborating group scoring 4.2% higher on each item (Figure 5.2). Additionally, the perception of the collaborating group regarding trust in their partners' integrity is significantly lower than the expectations of the non-collaborative group (the collaborating sample scoring 36% on the item tr4 (the partners are genuinely concerned about each other's success)

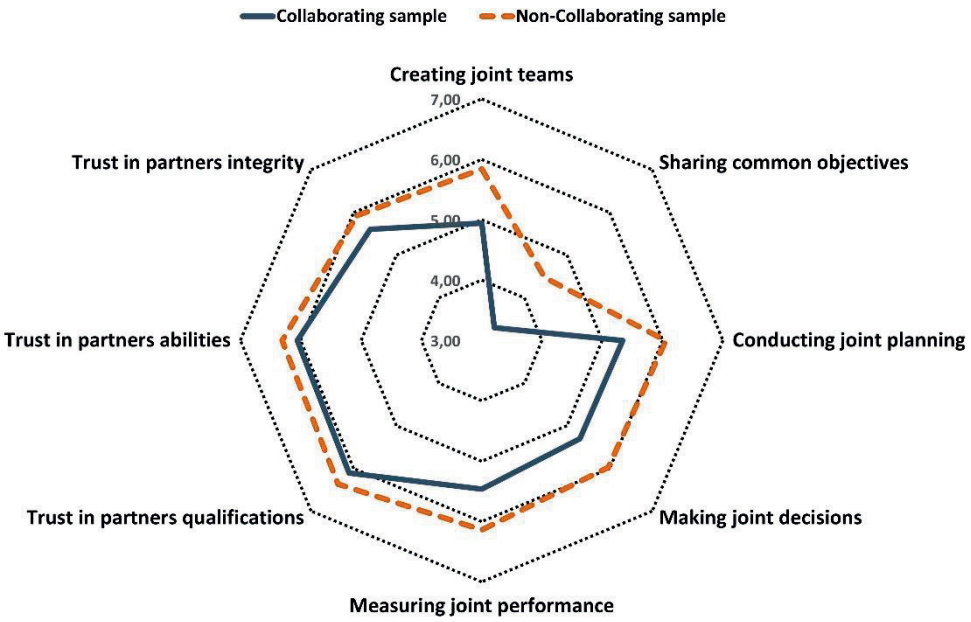

Figure 5.2: Significantly different items means (based on t-test at α = 0.05)

5.4.2 Collaboration limiting factors

10 Panellists took part in the *first phase* of the Delphi study. Half of the panellists listed 6 collaboration limiting factors explaining the difference in factor means for each of trust and joint relationship efforts, while the remaining half suggested 8 each, resulting in a total of 140 elements (70 for each of joint relationship efforts and trust). After removing duplicates and unifying the terminology, 18 aggregate limiting factors for *joint relationship efforts* and 18 factors for *trust* were identified. The lists of limiting factors identified in this phase are presented in tables 5.3 and 5.4.

Table 5.3: Full list of aggregate limiting factors for joint relationship efforts (number of times mentioned between parentheses)

Joint relation efforts limiting factors	**Panellists quotes examples**
The absence of costs and benefits allocation mechanisms (8)	"It is unclear how much each party makes which makes it hard to know how much to invest in the collaboration"
Lack of leadership in the collaboration (3)	"Endless debates regarding who should lead the collaboration"
Unperceived collaboration benefits (3)	"The partners that do not perceive the benefits of the collaboration are not very committed"
Lack of long-term visibility for the collaboration (strategic planning) (6)	"The partners are too focused on short-term financial gains. There is no long-term vision regarding where the collaboration is going"
Lack of collaboration formalization (who does what, who is responsible…) (8)	"Lack of awareness between the two partners regarding who is responsible for which activity"
Weak support from top management (2)	"The top management is usually absent from follow up meetings and take a lot of time to make decisions"
Weak technical skills of one of (or all) the partners to properly do their job (3)	"The partner's technical skills are too low"
Lack of collaborative skills (don't know how to work together) (3)	"We lack experienced personnel to manage the day to day operations of the collaboration"
Resistance to share information (8)	"Sometimes the partner hides important data which may impact our workflow"
Lack of commitment from the partners (4)	"The partner's behaviour does not show apparent commitment to our relationship"
Weak financial capacities (2)	"Sometimes a partner does not have the financial capacities to follow the collaboration planning"
The inadequate internal organization of the partners for collaboration (2)	"Some partners do not have a flexible organization to adapt with the needs of collaboration"
Objectives misalignment (6)	"The partners do not share the same objectives for the collaboration (e.g. improving client service, cost reduction…)
The complexity of joint planning and execution of collaborative activities (3)	"Sometimes the partner couldn't follow the initial planning, which has an impact on our workflow"
Resistance to change (2)	"The skills of each partner add value but is also a source of conflict as people like to do things the way they know"
Differences in collaborative cultures (")	"The values and principles are not necessarily the same among all the partners"
Lack of similarities between the partners (2)	"Differences in size, legal status, and type of resources can make the collaboration more complex"
Resistance to share expertise (2)	"Newly developed expertise is not necessarily shared between the partners"

Table 5.4: Full list of aggregate limiting factors for trust (number of times mentioned between parentheses)

Trust limiting factors	**Panellists quotes**
Lack of transparency regarding collaboration benefits (8)	"it is unclear how much benefit is generated by the collaboration for each partner"
Resistance to share information (10)	"Lack of regular exchange of information, especially when it comes to confidential strategic information"
The absence of conflict resolution mechanisms (4)	"absence of mechanisms to sort out conflicts between the teams of each partner"
Weak technical skills of one of (or all) the partners to properly do their job (2)	"We don't think that the partner is managing their operations effectively"
Lack of collaborative skills (don't know how to work together) (2)	"We lack experienced personnel to manage the day to day operations of the collaboration"
Lack of commitment from the partners (4)	"The partner's behaviour does not show apparent commitment to our relationship"
Lack of long-term visibility for the collaboration (2)	"The partners are too focused on short-term financial gains. There is no long-term vision regarding where the collaboration is going"
Lack of joint performance measurement (4)	"sharing feedback about the execution of the operational activities creates a confidence area between the partners"
Weak financial capacities (2)	"It is hard to trust that the partners will fulfil their obligations when they are financially struggling"
The power imbalance in the relationship (2)	"lack of respect between the partners due to power differences"
Lack of integrity from one (or all) the partners (8)	"the partners are more concerned about their own interests and how to take advantage of their partners"
The absence of regular face to face meetings (2)	"Face to face meetings help establish a close personal and professional relationship between the partners"
Frequent unilateral decision making (6)	"In urgent situations requiring fast decision making, we should listen to each other and don't take unilateral decisions"
The high number of decisions makers within one partner firm (2)	"There are so many people involved in making decisions at the level of our partner that it is unclear who we are dealing with"
Weak support from top management (3)	"The top management of the partner does not show clear signs of support and commitment"
Negative collaborative history of one of the partners (2)	"The existence of a history of badly managed collaboration experiences by one of the partners"
Lack of collaboration formalization (who does what, who is responsible…) (5)	"Difficulty to identify the personnel dedicated to the relationship by the partners"
The complexity of joint planning and execution of collaborative activities (2)	"The need to work with multiple partners can be a source of blockage"

During the *second phase* of the process, in which all the 10 panellists participated as well, each respondent was asked to select at least 10 factors from the aggregate list. The lists presented by the panellists covered all 18-limiting factor for joint relationship efforts and only 17 for trust, (none of the panellists selected "weak financial capacities of the partners" in their list). The criterion for reducing the number of collaboration limiting factors was to retain the elements which were selected by at least half of the panellists. Through this process, the number of limiting factors was reduced to 10 for joint relationship efforts, and 12 for trust

(see Table 5.5). Few limiting factors fell short of the imposed threshold (selected by 4 over 10 panellists), namely: weak technical skills of one of (or all) the partners to properly do their job, lack of collaborative skills, inadequate internal organization of the partners for collaboration, resistance to share expertise, weak support from top management, and negative collaborative history of one of the partners. The consensus between the panellists' chosen elements was tested using Fleiss Kappa (κ). The results indicate fair consensus, with $\kappa = 0.3$ for joint relationship efforts and $\kappa = 0.24$ for trust. This result shows the diversity of opinions among the panellists, providing initial indications that a consensus in the ranking phase may not be reached on the first trial in the third phase.

In the *third phase* of the process, the panellists were asked to rank the resulting list of factors from phase 2 from most to least important. The factors were presented in different orders for each panellist in order to avoid biases. The concordance between the produced ranking was tested using Kendall's *W*. The first ranking round resulted in a *W* of *0.547* for *joint relationship efforts* and *0.517* for *trust*, suggesting a moderate consensus. As such, a second ranking round was conducted to see if a better consensus could be reached. To help the panellists revise their rankings, we provided them with the following information: (i) the mean rank of each factor, (ii) the panellist's ranking on the factor in the previous round, and (iii) an indication of the panellists' current level of agreement. The revised ranking resulted in a good consensus among the panellists, with *W* values of *0.710* and *0.685* for the list of limiting factors for joint relationship efforts and trust respectively. Taking into consideration the reached level of consensus and the panellists' willingness to re-rank the elements a third time (which would represent the 5th round for them), we decided to terminate the Delphi study at this point. Table 5.5 presents the ranking results per round.

Table 5.5: Ranking results round-by-round

Limiting factors	Joint relationship efforts Mean Ranks (over 10)		Limiting factors	Trust Mean Ranks (over 12)	
	Round 1	Round 2		Round 1	Round 2
Lack of collaboration formalization (i.e. who does what)	2.60	1.80	**Lack of transparency regarding collaboration benefits**	1.40	1.40
The absence of costs and benefits allocation mechanisms	2.40	2.00	**Resistance to sharing information**	3.60	2.40
Resistance to sharing information	4.70	3.80	**Lack of integrity from one (or all) the partners**	4.60	3.80
Objectives misalignment	4.20	4.50	**Frequent unilateral decision making**	4.80	4.50
The absence of long-term visibility	4.80	4.90	**Lack of commitment from the partners**	6.70	6.40
Lack of commitment from the partners	5.80	5.80	**The absence of long-term visibility**	6.90	6.90
The complexity of joint planning and execution of collaborative activities	6.60	7.00	**Lack of joint performance measurement**	7.30	6.90
Resistance to change	6.20	7.70	**The power imbalance in the collaboration**	7.40	7.40
Differences in collaborative culture	9.00	8.60	**The absence of conflict resolution mechanisms**	6.70	8.50
Lack of similarities between the partners	8.70	8.90	**The absence of regular face to face meetings**	8.10	8.60
			Lack of collaboration formalization (i.e. who does what)	9.70	10.00
			The high number of decisions makers within one partner firm	10.80	11.20
Kendall's *W*	**0.547**	**0.710**		**0.517**	**0.685**

5.5 Discussion

The main objective of this research is to compare two independent samples illustrating the opinions of collaborating and non-collaborating industry professional regarding HLC success factors. The results show that differences exist in factor means for *joint relationship efforts* and *trust*, which are due to different structural and socio-cultural barriers identified through the Delphi study.

The first observed difference refers to the fact that the non-collaborating group has a significantly higher mean for joint relationship efforts than the collaborating group, meaning that *professionals' actual opinion regarding joint relationship efforts is significantly lower than their expectations*. This result was further supported by the observed differences in the items measuring joint relationship efforts between the two groups, which show that non-collaborating industry professionals' intentions to create joint teams, conduct joint planning, and make joint decisions do not fully translate into actions. Investigating the observed differences in terms of joint efforts resulted in the identification of ten factors limiting collaborative behaviour (Table 5.5), among which the *lack of collaboration formalization*, *the absence of a costs and benefits allocation mechanisms*, and *the resistance to share information* are the most important. First, the *lack of collaboration formalization* has a direct impact on the partners' ability to mutually plan and execute collaborative activities (Fawcett et al., 2015). According to Fawcett and Magnan (2001) and Fawcett et al. (2012), the absence of formalization creates confusion around who is going to oversee which tasks. Second, the *resistance to share information* also directly impacts the partners' ability to accurately plan and execute logistics activities as they lack complete information to make decisions (Ramesh et al., 2010). The lack of information sharing is one of the most recurring barriers in vertical collaboration literature (Akintola et al., 2000; Richey et al., 2010; Ramesh et al., 2010; Fawcett and Magnan, 2001; Fawcett et al., 2008b; Fawcett et al., 2012; Fawcett et al., 2015). According to Ramesh et al., (2010), inadequate information sharing results in behaviours that break down collaborative efforts. Sharing information does not only depend on the partners' willingness push for an open information sharing relationship, but also on the availability of the adequate information technology to do so (Akintola et al., 2000, Fawcett et al., 2015). Third, the absence of a clearly defined costs and benefits allocation mechanism diminishes the partners' willingness to participate in the collaboration. Sharing costs and benefits is essential for long-term focus in the collaboration (Ramesh et al., 2010). According to Cruijssen (2006), in the absence of clear costs and benefits sharing mechanisms, the partners keep questioning if each one is fairly participating in the collaboration activities and collecting adequate benefits, thus hindering the development of collaborative behaviour (Fawcett and Magnan, 2001). Nevertheless, fair allocation of costs and benefits remains a challenging task. Despite the existence of a multitude of methods to share costs and benefits following the principle of equity, considerable deviation from what is "fair" can occur

depending on the partner underlying intentions to share and their short of long-term perspective for the collaboration (Wagner and Lindemann, 2008)

The second observed difference is relative to the fact that non-collaborating group has a significantly higher factor mean for trust than the collaborating group. The expectations regarding trust in the partners' ability (tr1: partners being qualified to fulfil their obligations, tr2: partners having the skills to increase the collaboration performance) and integrity (tr4: the partners' genuine concern about each other's success) are higher than the reality of horizontal collaboration experiences. In other words, *while non-collaborating professionals* perceive trust in the partners' abilities and integrity as being important, *collaborating professionals believe that their partners' skills and integrity are lower than expected*. The Delphi study allowed us to put the light on several factors that have a limiting impact on the trust-building process between the partners in collaboration, the most important being the lack of transparency regarding the generated benefits, the reluctance to share information, and the partners' lack of integrity. First, the *lack of transparency regarding the generated benefits* in the collaboration relaunches the debate regarding the importance of fairly allocating the collaboration benefits, which directly impacts the partners' wiliness to collaborate (Fawcett et al., 2012). Financial savings remain the most important reason for firms to join HLC (Nollet and Beaulieu, 2003). If such savings are achieved, each partner should receive a fair share to improve the quality of the relationship (Wagner and Lindemann, 2008). In case a group member feels under-rewarded, it will attempt to restore equity through uncollaborative behaviour materialised by lack of trust and commitment (Schotanus et al., 2010). Second, in addition to its limiting impact of the operational activities, the reluctance to share information negatively impact the partners' trust toward each other. In the absence of information sharing, the partners can't develop a better understanding of each other's processes, which negatively impacts their trust level towards each other (Chen et al., 2011). The lack of efficient information sharing also negatively impacts the collaboration results, which in turn reduces the trust level in the relationship (Badraoui et al., 2019). Third, the lack of integrity of one or all the partners, which according to the respondents is materialized by greed and higher interest in one's self-goals rather than the collaboration partners' interests, has also been advanced as one of the most important elements restricting trust development. This result links back to the principle of fairness, which deviates among the partners

depending on their short or long-term intentions for the collaboration (Wagner and Lindemann, 2008).

In addition to the main barriers mentioned above, which have also been highlighted in vertical collaboration, the conducted research results in a new set of barriers relative to the partners' level of similarity and to the nature of the interaction between them (conflict resolution mechanisms, face to face meetings, number of decision makers). First, since HLC implies that partners complement each other through mutually undertaking logistics activities, a high level of similarity between the partners facilitates the planning and execution of the collaboration (Badraoui et al., 2019). The empirical results from Chapter 4 show the significant positive impact of partners similarity on joint relationship efforts, meaning that its absence has the potential to hinder the implementation of collaborative activities. Second, and similarly to the case of collaborating in a weak institutional context (Fuglsang and Jagd, 2015), firms can exhibit low trust in the absence of conflict resolution mechanisms in the relationship. Finally, the absence of regular face-to-face meetings and the high number of decision makers does not allow for the development of interpersonal relationships, which have been identified as having a positive impact on trust (Badraoui et al., 2019).

5.6 Managerial and theoretical implications

5.6.1 Managerial implications

By investigating the barriers that prevent collaboration partners from fully engaging in collaborative efforts, the research explains why HLC experiences fail to reach the desired objectives. The results of this research show differences between professionals' expectations and the reality of HLC when it comes to joint relationship efforts and trust.

The conducted tests revealed that the collaborating firms show lower levels of joint teams' creation, joint planning of collaborative activities, and joint decisions making compared to the expectations of the non-collaborating sample. Tracing possible reasons for these differences reveals a set of collaboration impediments that managers should address, which most important ones are related to poor *information sharing, weak collaboration formalization, and absence of costs and benefits allocation mechanisms*. First, regarding the lack of information sharing, partners should focus on *developing/acquiring adequate information technology systems* to facilitate information exchange. As explained in Section 5.5, sharing information does not only depend on the partners' willingness to do so but also

by the availability of adequate Information and Communication Technology (ICT) (Fawcett et al., 2015). Cruijssen (2006) states that ICT is essential for the long-term profitability of HLC as it enables collaboration and reduces transaction costs and risks. However, the partners should keep in mind that full adoption of ICT depends on the organizational context and should account for the employees' resistance to change (Chan et al., 2012). Second, the partners should focus on *formalizing the relationship*, i.e. defining responsibilities and dispatching tasks. A good assignment of roles based on the complementary competencies of the partners is essential for value co-creation (Fawcett et al., 2015). Failure to clarify roles and responsibilities creates tensions and can lead to collaboration reluctance (Fawcett et al., 2012). Third, collaborating partners should focus on the development of *costs and benefits allocation* mechanisms based on the principle of equity. Several cost allocation approaches based on the principles of cooperative game theory are available for horizontal collaboration (e.g. Özener and Ergun, 2008; Audy et al., 2011; Vanovermeire et al., 2014).

Managers should also reflect upon the factors limiting the development of trust between the partners. Besides the questions relative to information and sharing and costs/benefits allocation, practical issues such as making efforts to avoid unilateral decisions, provide the members with a clear long-term visibility on the collaboration, perform regular joint performance measurements, and to develop conflict resolution mechanisms are examples of actions that have the ability to promote trust between partners and positively contribute to the success of the collaboration. In principles, we believe, based on the empirical evidence from Chapter 4, that resolving barriers to joint relationship efforts and information sharing discussed in the previous paragraph will contribute to trust development in the relationship.

5.6.2 Theoretical implications

The chapter contributes to the horizontal collaboration literature by not just highlighting the similarities and differences between the expectations and actual experiences with regards to HLC success factors but also by highlighting the barriers that impede the development of collaborative behaviour. In doing so, this research answers the call of Fawcett et al. (2015) to develop an integrated model for collaboration linking its enablers and barriers.

The research shows that industry professionals expectations regarding HLC are not met in real collaboration experiences, which is due to several organizational and behavioural issues. On the one hand, the results show that several collaboration barriers are similar in both

vertical and horizontal collaboration, namely lack of formalization, absence of cost and benefits sharing mechanisms, resistance to share information, objectives misalignment, absence of long-term visibility, complexity of joint planning, resistance to change, lack of transparency, lack of integrity, frequent unilateral decision making, lack of joint performance measurement, power imbalance, differences in collaborative culture, and lack of commitment. this result confirms that, although different in nature, vertical and horizontal collaboration share a wide range of enablers and barriers (Basso et al., 2019). On the other hand, the research results in specific barriers for HLC, namely the lack of similarities between the partners, the absence of conflict resolution mechanisms, the absence of regular face to face meetings, and the high number of decision makers within one partner firm.

This research also highlights the importance of using mixed method research, i.e. considering quantitative and qualitative methods simultaneously, in studying collaboration. While survey-based research provides statistical ground for generalization of the findings, qualitative methods, such as Delphi, offer deeper insights into the observed patterns.

5.7 Future research and limitations

This research points to several areas where future work would be relevant. First, our research draws conclusions about differences between the intentions and expectation and actual behaviour and experiences of professionals regarding collaboration. While such a study captures the individuals' opinions at a fixed point in time, collaborative relationships last over a long period of time which might result in different opinions at later points in time. As such, conducting a longitudinal study (e.g. with latent growth models) may reveal changes in behaviour which are not captured by our model. Second, future research can also compare the expectations and actual opinions of one sample of professionals before and after they engage in collaboration. Such an experiment will allow us to observe changes in the individuals' behaviour and trace back the reasons behind them. Finally, future research can also focus on the implications of routinized behaviour in HLC, with the objective of developing practices for breaking organizational routines and developing collaborative skills.

Chapter 6 - General discussion and conclusions

In this chapter, we discuss the main findings from the different chapters presented in this thesis. First, a brief outline of the research is provided in Section 6.1. Second, the main findings from each chapter are summarized and integrated in Sections 6.2 and 6.3. Third, theoretical and managerial implications are discussed in Sections 6.4 and 6.5. The research limitations are outlined, and future research directions are discussed in Section 6.6. Finally, this chapter closes with some concluding remarks.

6.1 Brief outline of the research

The overall objective of this thesis was to obtain insights in classifications of Horizontal Logistics Collaboration, and factors influencing its outcomes in Agri-Food Supply Chains in Morocco. As presented in figure 1.2, four elements were identified as having an influence on HLC outcomes, namely the collaboration type, enablers, barriers, and the context in which the collaboration takes place. Each of these elements was investigated through four research objectives that build up to the overall objective of the thesis:

- RO1: Develop a typology of horizontal logistics collaboration concepts (*Chapter 2*);
- RO2a: Identify supporting and constraining factors influencing HLC in AFSCs in Morocco (*Chapter 3*);
- RO2b: Examine industry and country contexts effect on the factors influencing HLC (*Chapter 4*);
- RO3: *Examine the similarities and differences between industry professionals' expectations and actual opinion towards HLC (a) and identify which collaboration barriers limit collaborative behaviour (b)* (*Chapter 5*).

Chapter 2 was dedicated to introducing the horizontal logistics collaboration concept (see Figure 2.1). The research design comprised three steps. First, a literature review was undertaken to study interfirm collaboration types and develop our typology of horizontal logistics collaboration. Second, the most recurrent collaboration enablers and the context influence on the HLC scenario were discussed. Third, the collaboration outcomes were presented, and collaborative key performance indicators were identified.

In *Chapter 3*, we explored horizontal logistics collaboration enablers in the specific context of AFSCs in Morocco. The research followed a two steps approach. First, a literature review

was undertaken to study collaboration enablers and contextual factors. This first step resulted in the development of a conceptual model along with ten propositions. Second, the propositions were investigated through two in-depth case studies in the mill and juice processing industries, following a five-stage process consisting of (i) defining the research question, (ii) developing the measurement instrument, (iii) collecting the data, (iv) analysing the data, and (v) disseminating the results.

In Chapter 4, we tested the initial model developed in *chapter 3* (see Figure 3.1) by developing hypotheses and conducting a survey. We foremost investigated the impact of industry and country contexts on the relationship between the collaborative activities and the collaboration outcomes, through the mediation of relational factors. Data were collected using face-to-face and self-administered surveys. A total of 344 responses from different industries (agri-food industry: 129; Other industries: 215) and countries (High-income countries: 89; Low-income countries: 255) were collected.

In *Chapter 5*, we investigate similarities and difference between expectations and the reality of HLC. First, the study compares industry professionals' intentions and behaviour with regards to HLC success factors. Two samples were used in this study from the same data set collected in Chapter 4. The first sample (intentions) represents the expectations of non-collaborating professionals. The second sample (behaviour) represents the opinions of collaborating professionals. Second, the reasons behind the observed differences were further investigated, by means of a Delphi study, to identify which factors limit the development of collaborative behaviour.

Together, in chapters 2 to 5, we investigated each element of the research framework and the relationships between them, as presented in Figure 1.2 in chapter 1.

Table 6.1: Outline of the thesis chapters with regards to the HLCC components

	Chapter 2	**Chapter 3**	**Chapter 4**	**Chapter 5**
HLC type	✓			
HLC concept	✓			
HLC enablers	✓	✓	✓	✓
HLC barriers				✓
HLC context	✓	✓	✓	
HLC outcomes	✓	✓	✓	

6.2 Main findings

As presented in Figure 6.1, this thesis started by improving our understanding of what HLC is and what makes it successful, by diving into its operational mechanisms (chapter 2) and investigating the factors that influence the collaboration outcomes (chapter 3). The research then switched to studying the reasons why collaborative relationships fail to reach the desired objectives, first by considering the contextual effect (chapter 4) and then by adopting a behavioural perspective on the subject (chapter 5).

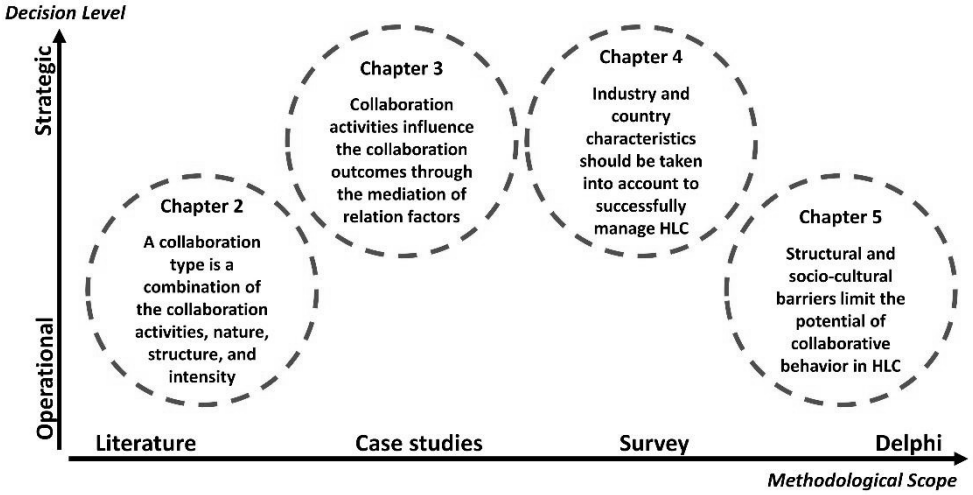

Figure 6.1: Scope of the thesis Research

Below we summarize the main findings for each chapter of the thesis:

6.2.1 Typifying Horizontal Logistics Collaboration Concepts

In *Chapter 2*, a review of the literature on interfirm collaboration resulted in the identification of four dimensions allowing to typify horizontal logistics collaboration. The first dimension, the *collaboration activities*, represents the logistics activities on which partners can collaborate. Depending on the areas they would like to improve, the partners can collaborate on procurement, transportation, manufacturing, and warehousing activities. The second dimension is relative to *the nature of the relationship between the partners* on the market, i.e. competitors vs non-competitors. This second dimension results in three possible collaboration forms, namely: competitive, non-competitive, and potentially competitive collaboration. The third dimension represents the *structure of the relationship*, which can take three forms depending on the formality of the collaboration and how close the partners

are: (i) an external entity managing the collaboration, (ii) an informal or formal coordination unit composed of employees from all the partners, and (iii) one of the partners managing the collaboration. The fourth and last dimension represents the *intensity of the collaboration*, i.e. the extent of direct involvement between partners, which ranges from low to high-intensity collaboration.

A *collaboration type* represents a combination of elements from each dimension. The decision for a specific element in a dimension is influenced by both the elements chosen on the other dimensions (e.g. a loose structure is more suitable when collaborating with a competitor to reduce the risk of information leakage) and the relational enablers of the collaboration (e.g. low trust levels lead to low collaboration intensity). Each collaboration type has different implications on the *HLC scenario*, which represents a way of working in horizontal collaboration described by: the managed system (the partners, their assets and resources, and their products), the managing system (the collaborative processes), the information system (the information exchanged between the partners), and the organizational structure (how the collaboration is managed). More specifically, each type implies sharing specific assets and resource, exchanging different kinds of information, integrating different processes, and adopting a different organizational structure.

In *Chapter 2*, we also briefly present the most recurring collaboration enablers in literature and discuss the impact of context on HLC. Regarding the enablers, both operational (*dedicated investments, resource sharing, information sharing, joint relationship efforts,* and *partners similarity*) and relational (*trust* and *commitment*) factors are presented. Concerning the context influence, the role of *industry* and *country* characteristics in HLC is discussed. The combination of the HLC type, enablers, context, and outcomes represent the Horizontal Logistics Collaboration Scenario (HLCC), which was illustrated by means of a case study. The results of this chapter are summarized in Figure 2.6.

6.2.2 Factors influencing HLC outcomes in Agri-Food Supply Chains (AFSCs) in Morocco

In Chapter 3, we investigated the relationships between HLC enablers and outcomes in the context of AFSCs in Morocco. The literature analysis resulted in a conceptual model for HLC (see figure 3.1), which posits that collaborative activities influence the collaboration outcomes, through the mediation of relational constructs. The collaboration activities

identified from the literature are *dedicated investments, resource sharing, information sharing, joint relationship efforts,* and *partners similarity*. The relational mediating factors that were identified from the literature review were *dependence, trust*, and *commitment*. The collaboration outcomes used in this study are relative to the partners' *satisfaction with the relationship* and *with the results*. In addition, the implications of the specific characteristics of AFSCs were discussed and incorporated in the conceptual model.

The model was then investigated through two case studies from the agri-food sector in Morocco, providing insights into the collaboration dynamics. First, the cases support the mediating role of relational constructs in the relationship between the selected collaborative and the collaboration outcomes. Second, in addition to the factors derived from literature, country-specific factors influencing trust development were identified, namely *sharing similar cultural values, the existence of interpersonal relationships,* and *uncertainty avoidance*. Third, the strict food safety regulations and the food products specific handling conditions limit the choice of possible partners to companies from the agri-food sector, whose products require similar handling conditions and present low interaction risks. Finally, the cases reveal that HLC is a dynamic system in which collaborative activities affect the collaboration outcomes and vice versa. Indeed, while engaging in joint efforts builds trust and commitment and leads to a feeling of satisfaction, positive outcomes also influence trust and commitment, which increases the willingness of the partners to collaborate. Figure 3.4 integrated all the findings from *Chapter 3*.

6.2.3 The context influence in Horizontal Logistics Collaboration

In *chapter 4*, we sought to advance our understanding of the context effect on HLC. Based on the initial conceptual model developed in *Chapter 3* (see Figure 3.1), we developed hypotheses and tested them by conducting a survey study. The reason behind using the initial model presented in Figure 3.1 and not the extended model presented in Figure 3.4 is that both pieces of research were conducted in parallel. The impact of this decision is later discussed in Section 6.6. The findings show that our conceptual model, linking collaborative activities to the collaboration outcomes, is supported by samples from different industry and country categories, meaning that the set of relationships governing HLC remain the same across industries and countries. Nevertheless, the significant positive impact of partners similarity

on joint relationship efforts means that, in order to be successful, partners still need to operate in a similar way and manage products that require similar handling conditions.

While the overall model fits well within each sample, comparing the results across industries and countries revealed few differences. Industry-wise, the effect of dependence on commitment was only significant in the food sample, creating an indirect effect of dedicated investments on commitment. This difference was explained by the fact that AFSCs rely on expensive specialized technical equipment that requires high capacity utilization. Thus, through mutual investments, the partners can ensure an adequate utilization level of the specialized equipment. This situation creates a dependence between the partners, which results in more commitment. Country wise, the effect of trust on commitment is stronger in UMHI countries compared to the LMLI countries. This result was explained from the perspective of LMLI country's social and institutional characteristics. On one hand, the trust level in LMLI countries is low outside family structures and is influenced by additional elements such as interpersonal relationships, shared values, and uncertainty avoidance. On the other hand, the weak institutional context of LMLI countries limits the willingness of firms to show commitment as they fear the absence of conflict resolution mechanisms.

6.2.4 Structural and socio-cultural barriers to collaboration

The comparison conducted in *chapter 5* between non-collaborating industry professionals' expectation and collaborating professionals' feedback with regards to HLC success factors resulted in significant differences. The collaborating sample shows significantly lower factor mean values for joint relationship efforts and trust than the non-collaborating sample. Regarding joint relationship efforts, the collaborating industry professionals engage in less collaborative efforts than the recorded intentions in terms of creating joint teams, sharing common objectives, conducting joint planning, making joint decisions, and performing regular joint performance measurements. Concerning trust, the collaborating group exhibits lower trust levels toward their partners' ability to improve the collaboration performance and their integrity towards each other.

An investigation of the observed differences, by means of a Delphi study, resulted in the identification of a set of barriers limiting collaborative behaviour. The industry professionals explained the observed differences in joint relationship efforts by 10 barriers, out of which the *lack of collaboration formalization, the absence of clear costs and benefits allocation*

mechanisms, and *the resistance to share information* are the three most prominent. The differences in trust levels were matched with 12 collaboration barriers, the three most important one representing the *lack of transparency regarding collaboration benefits, the resistance to share information,* and *the lack of integrity from one (or all) the partners*.

6.3 Integrated findings

So far in this chapter, the findings of each chapter were presented separately. This section integrates the findings from each chapter using the horizontal logistics collaboration concept introduced in Chapter 2 (see Figure 2.1). Together, the chapters build up to the overall objective of this thesis, i.e. improving our understanding of the different elements that influence the HLC outcomes.

From the conclusions of the different chapters, clear interactions can be identified between all the elements influencing the collaboration outcomes (see Figure 6.2), as will be discussed in the next paragraphs. First, the chosen *collaboration activity(ies)* defines the content of the *operational enablers*, while the *relational enablers* influence the chosen *collaboration intensity* and *structure*. Second, the *industry context* increases the importance of some *operational activities*, while the *country context* influences the development of *trust* and *commitment*. Third, the *collaboration barriers* limit both the implementation of *joint relationship efforts* and the development of *trust* in HLC. Finally, the collaboration *operational enablers* positively impact the *relational enablers*, which in turn positively impact *HLC outcomes*. The instantiation of each the collaboration type, enablers, barriers, and context represent an HLC scenario, which results in collaboration performance and ultimately in the satisfaction of the partners. The straight lines represent causal relationships, i.e., the potential influence of one element on the other. The dotted lines represent the real operational system in which collaboration takes place (information is exchanged, processes are integrated, etc) and performance is realised.

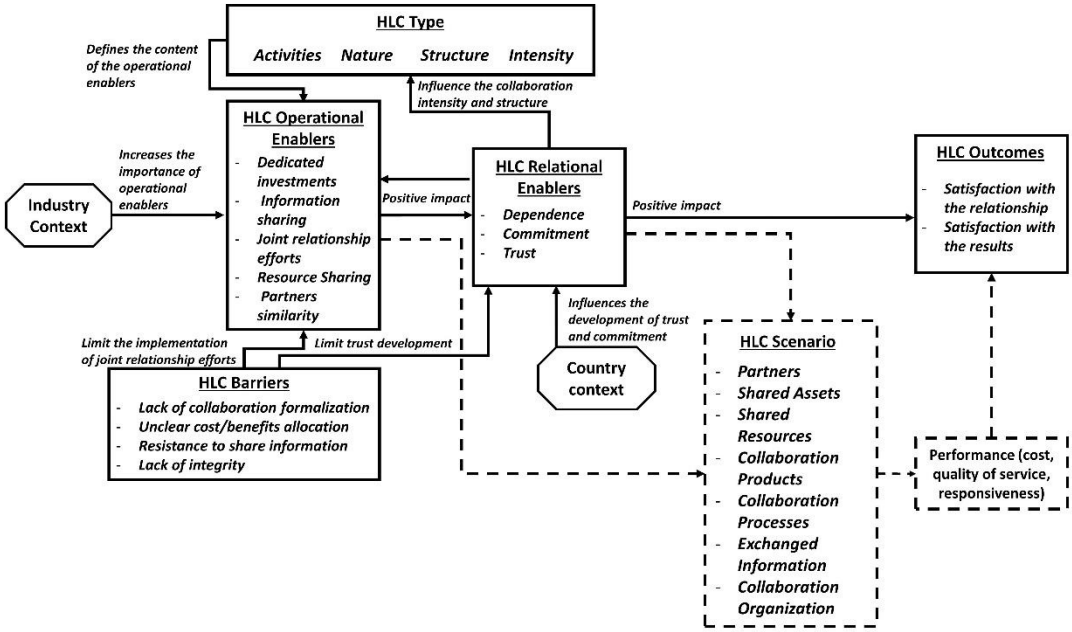

Figure 6.2: Integrated model for Horizontal Logistics Collaboration

6.3.1 The two-way interaction between the collaboration type and the collaboration enablers

The first interaction represents the two-way relationship between the collaboration type (*Chapter 2*) and the collaboration operational and relational enablers (*Chapter 3*). On the one hand, the chosen *collaboration activity(ies)* defines the content of the *collaboration operational enablers*. Based on literature, we show in *Chapter 2* that depending on which logistics activity(ies) the partners want to collaborate on (procurement, transportation, warehousing, manufacturing), specific assets need to be shared or invested in, specific processes require integration, and precise information needs to be exchanged for a smooth execution of the collaboration activities (see Table 2.3). The cases presented in *Chapter 3*, which cover different logistics activities, complement Table 2.3 by providing operational details from real experiences regarding the information and resources shared and integrated processes.

On the other hand, the process of selecting a collaboration structure and intensity considers the initial *trust* level between the partners. In *Chapter 2*, claims regarding which structure and intensity to adopt based on trust are made using literature. In *Chapter 3*, the presented case studies confirm the role played by trust in determining the collaboration structure and

intensity. In the absence of an initial *trust* level (resulting from the existence of prior *interpersonal relationships*), the partners tend to lean towards low-intensity collaborations with informal or loose structures (collaborating through an *external entity*). Building trust gradually increases the collaboration intensity and favours the development of tighter structures such as the *virtual network* or the *channel integrator*. In addition to the role of trust, the case studies revealed that the collaboration structure is also subject to trade laws and regulations of the country.

6.3.2 The interaction between the industry and country contexts and the collaboration enablers

The second interaction refers to the impact of the industry and country contexts on the collaboration operational and relational enablers. In Chapter 2, we introduced the potential effect of context on HLC based on literature and an illustrative case study. In *Chapter 3*, the impact of AFSCs and the characteristics of a developing country on the collaboration operational and relational enablers was further investigated through 2 in-depth case studies. Industry-wise, the case studies revealed the importance of products and processes similarity in the context of AFSCs. Because food products quality and safety are sensitive to the conditions under which they are produced, stored, and distributed, firms operating in the agri-food sector are obligated to choose a partner with products requiring similar transportation and storage conditions. Country wise, the case studies showed how trust is subject to factors other than the identified operational enablers. In the case of a developing country (i.e., Morocco), interpersonal relationships, shared values, and uncertainty avoidance influenced the initial trust level in the relationship, which in turn had an impact on the collaboration intensity.

The empirical results presented in *Chapter 4* further confirm and extend these findings. First, while partners similarity was found to be equally important for companies operating in and out of the agri-food sector, product similarity had a statistically significantly higher mean score in the food sample. Second, the need for expensive specialized technical equipment in AFSCs increases the importance of dedicated investments, which is materialized by the positive impact of dedicated investments on commitment, through the mediation of dependence. Finally, the impact of trust on commitment was significantly lower in developing countries compared to developed countries, which is due to both the poor

institutional context of developing countries, and the role played by interpersonal relationships, shared values, and uncertainty avoidance in trust development.

6.3.3 The impact of structural and socio-cultural barriers on collaboration enablers

The third interaction highlighted in this thesis is relative to the limiting impact of structural and socio-cultural barriers on the collaboration enablers. Throughout the thesis, HLC has been presented a hard to implement strategy with very few successful cases (Martin et al., 2018, Basso et al., 2019). After establishing that context has a statistically significant but yet moderated effect on HLC, a shift from researching what enables collaboration to what hinders it was essential. As such, results from *Chapter 5* complement the so far presented findings by investigating the factors having a limiting impact on the collaboration enablers empirically studied in chapters 3 and 4.

Behind the failure of horizontal collaboration relationships hide several barriers that limit the development of collaborative behaviour. More specifically, collaboration barriers result in a lower engagement of industry professionals in *joint relationship efforts* and in lower *trust* levels in the relationship. Regarding the barriers to the implementation of *joint relationship efforts*, our research in *Chapter 5* identified the main practical barriers raised by industry professionals are *objectives misalignment, lack of collaboration formalization, resistance to share information, and the absence of a fair cost and benefits allocation mechanism*. These barriers have a direct impact on the partners' ability to mutually plan and execute collaborative activities as well as on their willingness to participate in the collaboration. Concerning the barriers to *trust* development, industry professionals identified the *resistance to share information, lack of transparency regarding the collaboration benefits, frequent unilateral decision making, and lack of integrity from one or all the partners*. These barriers prevent the partners from developing a better understanding of each other's processes, increases the risk of opportunistic behaviour, and diminishes the partner's willingness to participate in the collaboration.

The above discussion clearly demonstrates the complexity of horizontal logistics collaboration. Accounting simultaneously for the (i) collaboration type, (ii) the operational and relational factors that influence the collaboration outcomes, (iii) the context influence, and (iv) the barriers that limit the development of collaborative behaviour is a challenging

task. In Figure 6.2, we presented an integrated model for HLC, which allows to visually connect the four elements mentioned above.

6.4 Theoretical contributions

This research has made several theoretical contributions to different research fields in operations management.

6.4.1: Contribution to the literature on Horizontal Logistics Collaboration success factors

The first contribution of this thesis is relative to the identification of the factors influencing HLC outcomes. To date, the literature on horizontal collaboration still refers to the scarcity of contributions on the subject and that insights can be derived from vertical collaboration literature (Martin et al., 2018, Basso et al., 2019, Sheffi et al., 2019). By starting from the literature on vertical collaboration, integrating factors specific to horizontal collaboration, and empirically testing their significance in HLC relationships, this research shows that both vertical and horizontal collaboration share many common enablers. Factors such as information sharing, joint relationship efforts, resource sharing, trust and commitment influence collaboration outcomes in both strategies.

Nevertheless, few differences difference exist between vertical and horizontal collaboration. The first difference is dedicated investments do not necessarily lead to more commitment in horizontal logistics collaboration relationships. This observation contradicts the established relationship between the two factors in vertical relationships (Nyaga et al., 2010), in which the partners show more commitment in order to secure their investments. The difference is explained by the fact firms engage in HLC to share complementary resources and increase their utilisation rate (Soek and Nof, 2014) rather invest in assets dedicated to the relationship. The second difference is relative to the importance of partners similarity for horizontal collaboration. While the literature on vertical collaboration point to size similarity as an important element ensuring a balance of power in the relationship, HLC requires also the partners to have similar products and processes. The results from the case studies presented in Chapter 3 show the role played by partners similarity in the partners' selection process, which is in line with the recent literature on HLC (Pan et al., 2019). This observation is further confirmed by the consistent significant impact of partners' processes and products similarity on joint relationship efforts across industry and country categories.

Another contribution to the literature on Horizontal Logistics Collaboration is the development of a practical typology which not only classifies collaboration types but also provides details regarding the implications of each type in terms of the information that should be shared, the assets that should be invested in or shared, the processes that need to be integrated, the structure to adopt, and the performance indicator to use in order to access the collaboration outcomes. This contribution is in line with recent calls to investigate the operational mechanisms that help companies create successful HLC relationships (Brekalo and Laers, 2016).

6.4.2: Contribution to the literature on the context influence in collaborative relationships

This thesis considers the context influence on HLC by investigating the factors influencing its outcomes in different industry and country categories. Starting from the premise that the context under which collaboration is undertaken could have an impact on the factors influencing HLC outcomes (Saenz et al., 2015), we investigated horizontal collaboration in different industry and country contexts. The results indicate that the factors influencing collaboration outcomes as well as the relationships between them are more similar than they differ when comparing the agri-food industry to other industries and developed to developing countries. Even though literature on vertical collaboration demonstrated a context impact on collaboration outcomes (Matopoulos et al.,2007; Flynn et al., 2010; Van der Vaart et al., 2012; Rossi et al., 2013), the observed impact is mainly due to context macro and micro characteristics such as the availability of adequate logistics infrastructure (Reaidy et al., 2015) and skilled labour (Ansell and Gash, 2008). A fundamental difference between these works and the research conducted in this thesis is that we are not looking for the direct impact of context on the collaboration outcomes, but rather on how context influences the relationship between collaboration enablers and outcomes. On this specific point, the empirical results show the existence of few differences relative to the indirect effect of dedicated investments on commitment and the direct positive impact of trust on commitment.

Notable differences in the relationship between collaboration enablers and outcomes are (i) the significant positive impact of dependence on commitment, which was only found in the food industry, and the (ii) higher impact of trust and commitment in developed countries compared to developing countries. The first difference is due to the capital intensive specialized technical equipment needed in the food industry (Van der Vorst et al., 2011),

which increases the partners' dependence on the collaboration to ensure high capacity utilisation of the equipment. The second difference is related to the weak institutional context of developing countries, which is perceived by firms as not offering enough guarantees for on-time and fair resolution of conflicts (Fuglsang and Jagd, 2015, Hemmert et al., 2016). The second difference can also be related to other elements influencing trust development in collaborative relationships, such as interpersonal relationships (Abbad et 2008) and collaborative culture (Zhang and Cao, 2018), which have both been highlighted in Chapter 3.

6.4.3: Contribution to the literature on collaboration in AFSCs

The third contribution of the thesis is relative to the investigation of the interplay between the factors influencing collaboration in AFSCs. To date, a substantial number of contributions on collaboration in AFSCs exist, but research that investigates factors influencing collaboration in AFSCs is still much limited (Dania et al., 2018) and there still is a need for an in-depth understanding of the collaboration dynamics in this industry (Aggrawal and Srivastava, 2016). This research started with the premise that the characteristics of AFSCs detailed by Van der Vorst et al. (2011) and Tsolakis et al. (2014) have the potential to influence how collaboration factors influence each other as well as the collaboration outcomes. The obtained empirical results show that AFSCs characteristics have indeed an impact on the factor influencing the collaboration outcomes. First, the positive impact of dependence originating from dedicated investments was only significant in the food industry sample (Chapter 4). Second, partners similarity in terms of products and processes influenced the partners' selection process in the case studies presented in Chapter 3. Therefore, this research contributes to elucidate which factors are relevant for horizontal collaboration in AFSCs and what the industry context influence is.

6.4.4: Contribution to the literature on collaboration barriers

The fourth contribution is relative to the development of an integrative model for HLC linking collaboration enablers and barriers. Despite the existence of several contributions on the barriers that impede the development of collaborative behaviour (Akintola et al., 2000; Richey et al., 2010; Ramesh et al., 2010; Fawcett and Magnan, 2001; Fawcett et al., 2008b; Fawcett et al., 2012) linking collaboration barriers to the collaboration enablers remain essential to *"help assure that more companies migrate from the vicious cycle of entrenched*

resistance to the virtuous cycle of relational advantages" (Fawcett et al., 2015). This research identifies the HLC success factors for which industry professionals' expectations are not met, namely joint relationship efforts and trust.

Investigating the reasons behind these differences results in numerous collaboration barriers, which are in line with the barriers for vertical collaboration as argued by Basso et al. (2019). Nevertheless, the research also highlights barriers specific to HLC, namely the lack of similarities between the partners, the absence of conflict resolution mechanisms, the absence of regular face to face meetings, and the high number of decision makers within one partner firm.

6.4.5: Use of mixed methods research in operations management

The research conducted in this thesis also highlights the importance of using mixed methods research to study horizontal collaboration. Adopting a mixed method approach follows recent methodological trends in Supply Chain Management research (Baske-Janssen et al., 2015). Using mixed methods allows to thoroughly analyse and investigate supply chain strategies (Taticchi et al., 2015; Giannakis and Papadopoulos, 2016; Dubey et al., 2015). By combining case-based and survey-based research methodologies, this research unveiled the hidden facets of HLC. On one hand, the survey-based studies allowed us to test the formulated hypotheses, investigate the context effect, and compare the expectations and reality of HLC. On the other hand, the qualitative case studies and the Delphi study were essential in order to understand the collaboration dynamics, comprehend the different stages and changes the collaboration goes through, and identify the barriers that limit collaborative behaviour.

6.5 Managerial implications

In practice, decision makers are confronted with many challenges to find adequate arrangements that facilitate the execution of horizontal logistics collaboration (Basso et al., 2018). This section translates our findings into practical implications for firms that wish to enter a collaboration experience. Below we formulate some managerial recommendations based on the research conducted in this thesis.

The *first recommendation* is relative to the context of AFSCs, which we designated as the industry context for this study. The case studies conducted in Chapter 3 indicate how the characteristics of food products (Van der Vorst et al., 2011) and the food safety regulations (Akkerman et al., 2010) limited the firms' choice of partners to those whose products and

processes are compatible with theirs. While the empirical results presented in Chapter 4, do not show a significant difference in the impact of partners' similarity of joint relationship efforts, which was related to sampling considerations, it shows that partners are more likely to engage in joint relationship efforts when they have similar processes and operate similar products. Therefore, by combining the results from Chapters 3 and 4, firms in AFSCs should look for partners with (i) similar processes to reduce the need for adaptation, (ii) products requiring similar logistics handling equipment to mutually use already available equipment, and (iii) products with similar transportation and storage conditions to allow for load consolidation and reduce transportation and storage costs.

The *second recommendation* concerns the specific case of Morocco, which we also designated as a research context in this study. The empirical study conducted in Chapter 4 points to the importance of the institutional system in promoting trust and commitment, which in turn lead to the satisfaction of the partners. The study shows that in a strong institutional context, firms are more likely to commit as a result of trust, which increases the collaboration chances to succeed. Morocco should, therefore, put more efforts into developing a strong institutional context for collaborative relationships, which provides economic actors with clear and fair conflict resolution mechanisms. With the creation of the Moroccan Agency for Logistics Competitiveness, the government has made a first step towards institutionalizing the logistics arena. Nevertheless, the agency, which role is limited to consultancy and promotion, should be empowered to act as a real regulator for the sector. Firms operating in Morocco should also pay close attention to other factors that influence trust development in collaboration. Besides information sharing and joint relationship efforts, the case studies conducted in Chapter 3 refer to the importance of interpersonal relationship, shared cultural values, and uncertainty avoidance in establishing trust. While cultural values are characteristics that can't change over a short period of time, firms should work on developing (i) interpersonal relationships with their partners, and (ii) mechanisms to reduce uncertainty avoidance (e.g. extensive and transparent information sharing).

The *third recommendation* is to foresee and act on collaboration barriers before they become constraining. In this thesis, we have reached the conclusion that collaborative experiences do not always reach their objectives, and that the partners' positive intentions do not necessarily translate into actions. Investigating possible reasons behind this situation reveals a set of collaboration structural and socio-cultural barriers that limit the joint operational efforts in

the relationship as well as the trust development process, which are both crucial for the collaboration success. The main practical barriers raised by industry professionals are *objectives misalignment, lack of collaboration formalization, resistance to share information, absence of a fair cost and benefits allocation mechanism, and frequent unilateral decision making*. Besides the resistance to share information, the remaining barriers can be defused prior to the implementation stage of the collaboration. First, the partners' selection stage should serve as an opportunity for the partners to discuss and align their objectives for the collaboration. Second, the partners should spend time in defining the tasks to be performed within the collaboration and assigning responsibilities to clarify who is responsible for what. This step will also reduce the frequency of unilateral decision making as each party is aware of its remit. Third, much consideration must be given to defining how costs and benefits are going to be shared, as to feelings of unfairness within the group. Regarding information sharing, Zhang and Cao (2018) suggest the development of inter-organizational systems which facilitate real-time information sharing and process integration.

The *fourth recommendation* is for the partners to work towards developing trust in the relationship. Throughout this thesis, trust has been advanced as the main factor enabling collaboration. The results obtained from chapters 3 and 4 confirm the positive impact of trust on the relationship outcomes and show that several factors contribute to its development. More specifically, the research shows that joint relationship efforts and information sharing are the two main factors that contribute to trust development in a relationship, supporting the premise that the partners' actions define their trustworthiness, which in turn defines their success. The case studies conducted in Chapter 2 suggest that trust is also subject to cultural norms, such as the presence of prior interpersonal relationships and shared values. Nevertheless, these elements have been advanced as relationship facilitators rather than pillars on which trust is based. An interviewee from the first case study said: "*no matter the kind of prior relationships the partners have, there is no default trust in business. Only your actions define if you are worthy of trust*".

6.6 Research limitations and future research directions

This research provides a detailed analysis of horizontal logistics collaboration success factors and points to several areas where future work would be relevant.

First, the Horizontal Logistics Collaboration Concept (HLCC), introduced in *Chapter 2*, remains a theoretical advancement requiring practical applications. Even though chapters 3, 4 and 5 empirically explore the components of the HLCC as well as the relationship between them, resulting in the integrated model presented in Figure 6.2, a broader comprehensive application of the concept on horizontal collaboration cases is necessary to evaluate its accuracy and applicability.

Second, the thesis uses a limited number of case studies to investigate the factors having an influence on the collaboration outcomes in the case of a developing country. Although the cases allowed us to verify the formulated propositions in *Chapter 3*, a higher number of cases is needed for the purpose of theory testing (Voss et al., 2002). In addition, the cases are drawn from one country, i.e. Morocco, which does not guarantee the applicability of the findings to other developing countries. As such, **future research on the factors influencing HLC in AFSCs in developing countries should consider a larger number of case studies draw from different developing countries.**

Third, the research draws several conclusions on survey-based studies capturing industry professionals' opinions at a point in time. Since collaborative relationships span over long periods of time and go through different phases (Martin et al., 2018), the individuals' opinions regarding the collaboration state might change from one phase to the other. ***As such, future research can focus on developing analysing HLC enabling and/or constraining factors for each collaboration phase or conducting longitudinal analysis (e.g. latent growth models), which may reveal insights that were not captured in our study***. The need for such studies can be partially seen at the level of the case studies presented in *Chapter 3*, which show changes in the partners' trust and commitment levels over time-based on their satisfaction with the collaboration outcomes.

Fourth, this study investigates the context effect by comparing samples from different country and industry contexts and links the identified differences to each context's characteristics. As mentioned in Section 6.2, the study conducted in Chapter 4 is based on the initial model presented in Figure 3.1 rather than on the completed presented in Figure 3.4 considering contextual factors. To make stronger claims regarding the existence of a contextual effect, country and industry characteristics should also be measured and integrated into the survey study. The conclusions reached by the research presented in *Chapter 4*

provide a strong basis for ***future research to develop new specific hypotheses regarding the expected impact of context characteristics on HLC success factors*** (e.g. the impact of uncertainty avoidance as a country cultural characteristic on trust).

Fifth, ***future research should also study the difference between industry professional's intentions and actual behaviour by analysing two related samples representing the same group of individuals before and after the collaboration begins***. In contrast with what has been done in *Chapter 5*, such an experimental study will enable us to dive much more into the individual's behaviour and develop a better understanding of the operational and relational mechanisms that moderate the relationship between intentions and behaviour in HLC.

Sixth, the survey-based studies presented in chapters 4 and 5 are based on a convenience sample instead of a random sample. Indeed, data were collected by making on-site visits to companies and by participating in trade shows. Although efforts were made in the statistical analysis to ensure the reliability and validity of the measured constructs, results obtained from a convenience sample cannot be automatically generalised to the overall population. In this regard, ***future research can test the conceptual model developed in Chapter 4 on a random sample of logistics managers in order to obtain more accurate and generalizable results***.

Finally, reflecting on the research conducted in this thesis with regards to its overall objective, it is evident that other methodological approaches can bring valuable additional insights to the topic. First, ***Operational Research (OR) models*** have proven to be very useful in studying horizontal collaboration and remain amongst the current trending topics in supply chain management (Speranza, 2018). They represent powerful tools allowing to quantify the potential benefits of HLC from an operations perspective (Soysal et al., 2018; Stellingwerf et al., 2018). However, building OR models is challenging as it requires the development of a representation of the current situation and possible collaboration scenarios, thus providing insights on how the operational activities should be organized. Second, because human behaviour in a complex system such as HLC cannot be fully managed, using ***agent-based modelling*** (ABM) to simulate collaboration scenarios and analyse the impact of different decision models for the different stakeholders is an interesting research perspective. ABM has been used in many scientific areas to model the interaction between individuals (Garica

and Jager, 2011). More specifically, ABM allows researchers to simulate human interactions in a cross-cultural setting, thus capturing context macro phenomena on the behaviour at the micro level. In the field of collaboration, agent-based modelling is a promising methodology in order to account from the cultural context influence on the agents' behaviour Hofstede (2015).

The discussion above supports Horizontal Logistics Collaboration as a trending research topic in operations and supply chain management. The diversity of methods and approaches that can be used to study different aspects of the subject provide a rich scientific basis for future research.

6.7 Final word

In this thesis, we explored different aspects of Horizontal Logistics Collaboration to increase our understanding of how to successfully implement it. The research mobilised theories and concepts from different areas of operations management (Figure 1.2) and made use of different methodological approaches (literature review, case studies, survey, Delphi) to capture the multidimensional aspect of HLC. The results from the different chapters provided us with useful insights that can be used to design, implement, and evaluate horizontal collaboration relationships.

This research was motivated by an urging societal problem pertaining to the numerous logistics challenges faced by the economic actors in Morocco in terms of products distribution. I hope that the new insights provided in this thesis can assist these actors in developing horizontal collaboration relationships, which will not only help increase their competitiveness but also decrease the environmental impact of their logistics activities.

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Appendices

Appendix 1. Case studies interview guide

Part 1- Introducing the collaboration experience and its objectives

1. **Can you briefly talk about your collaboration experience?**
2. **Why did you decide to collaborate on these specific activities?**
   - **Dumping question:** What were the objectives behind the collaboration?
3. **Can you talk about your collaboration partners?**
   - **Dumping question:** What elements did you consider when choosing the partners?
   - **Dumping question:** Were some of the collaborating partner's actual competitors?
4. **Can you explain how was the collaboration managed?**
   - **Dumping question:** Who was responsible for the coordination of the operations?
   - **Dumping question:** What were the elements that motivated this choice?
5. **What do you think were the reasons behind the success/failure of the collaboration?**

Part 2- Collaborative activities

6. **Did the collaboration partners invest in relationship-specific assets?**
   - **Dumping question:** what kind of assets?
   - **Dumping question:** to whom did the assets belong?
   - **Dumping question:** in case of shared ownership, was it clearly defined how these resources were going to be split once the collaboration is over? Can you explain how?
7. **Did the collaboration partners combine some of the resources they already had?**
   - **Dumping question:** Can you specify which resources were shared and to what percentage?
   - **Dumping question:** Were there rules on using shared resources? Can you provide some examples?
8. **Were different partners similar in terms of size and negotiation power?**
   - **Dumping question:** Do you think the firm size influenced the negotiation power of the members? Can you provide examples when this happened?

9. **Were the handled products homogeneous? / Did the product require similar transportation, storage, or manufacturing technologies?**
    - **Dumping question:** How do you think product homogeneity influenced your decisions in the collaboration?
10. **Were there uniform procedures/ processes followed by all the partners?**
    - **Dumping question:** Did you develop integrated processes with your partners??
    - **Dumping question:** Did you have to adapt your operations to the way your partners were working? Can you provide an example?

10 Was there a formal cost/benefits allocation mechanism?

- **Dumping question:** Can you explain how?

11 What kind of information did you share with your partners?

- **Dumping question:** Was the information directly shared with partners or was there an intermediary?
- **Dumping question:** What motivated the way information was shared?

12 How frequently was information exchanged between the partners?

- **Dumping question:** Do you think this information exchange frequency was sufficient?

Part 2- Relational Factors

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13 How would you rate the trust level you have with your partner(s)?

- **Dumping question:** has it always been this way? Did it evolve or diminish over time;
- **Dumping question:** what do you think were the reasons behind the development (or the decrease) of your trust towards your partner(s)?

14 How would you rate the commitment level in collaboration, and what elements played a role in its development?

Appendix 2. Questionnaire

As part of a PhD research project conducted at Wageningen University and Research (the Netherlands), in partnership with the National Institute for Agricultural Research in Morocco, we conduct a study on factors likely to influence the stability and sustainability of horizontal logistics collaboration. Horizontal logistics collaboration is a **business strategy that consists of two or more firms, operating at the same supply chain level, working together to improve their respective performances.**

I would like to ask you to contribute to our study by filling in this questionnaire. The questionnaire is composed of 4 parts, with a total completion time estimated to be **15 minutes**. The first part consists of general questions regarding your collaboration objectives, activities and structure, as well as some general questions about your company. In the other parts, we will ask you about your opinion with respect to collaboration-enabling factors. There are no "good" or "bad" answers, as only your opinion counts in this research.

We believe that your contribution is extremely valuable in improving the existing knowledge regarding horizontal collaboration and identifying the factors that contribute to its success.

By filling the survey below, you give us permission to use your answers for the purpose of our research. Information confidentiality is ensured for all participants through all the stages of the research. The survey responses are anonymous; however, should you wish to receive an overview of the research results, you are invited to provide your email address at the end of the survey, which we will only use for that purpose.

In case you have any questions regarding the survey, feel free to contact me at the e-mail address below.

Kind regards and many thanks in advance for your contribution to our study.

PART 1: GENERAL INFORMATION

1. In which industry does your company operate?

Cross the appropriate answer

□ Agri-Food (Agriculture, Livestock and Fisheries
□ Manufacturing and assembly
□ Climate and Environment
□ Transportation and Logistics
□ Construction and real estate
□ Wholesale and retail
□ Energy and Water

2. In case you operate in the agri-food sector, at which level of the supply chain are you? (ONLY ANSWER THIS QUESTION IF YOUR ANSWER IS AGRI-FOOD FOR QUESTION 1)

□ Input provider □ Farmer □ Processor □ Trader/wholesaler □ Retailers

3. What is the approximate total number of employees in your company?

Cross only one answer.

□ less than 50 □ 50 - 99 □ 100 - 149 □ 150 - 249 □ more than 250

4. In which country is your company located?

_ _

5. What is your position within the company?

Cross the appropriate answer(s).

□ Logistics manager □ Financial manager □ Production manager □ Director □ Other_ _ __ _ _ _ _ _ _ _

6. Have you previously been involved in a horizontal collaboration experience?

Horizontal collaboration refers to the situation where two companies operating at the same supply chain level (not necessarily the same supply chain) work together to reach mutual goals.

□ Currently collaborating □ Have collaborated in the past □ Have never collaborated

IF "HAVE NEVER COLLABORATED" IS CHOSEN FOR QUESTION 6, PLEASE SKIP TO QUESTION 32 PAGE 7. IF ONE OF THE TWO FIRST OPTIONS IS CHOSEN, PROCEED WITH QUESTIONS 6 TO 31.

****Please answer the following questions based on the actual state of the collaboration (or last known state if the collaboration is over). In case of multiple collaboration experiences, answer the following questions for the most important one in terms of the number of volume of operations performed together.***

7. How long has the collaboration been running (or how long did the collaboration last)?

Report the answer in years.

_ _

8. Please identify the main product group(s) subject to collaboration.

_ _

9. Please indicate the transportation and storage conditions required for the product groups?

Select all that apply.

□ Frozen □ Controlled atmosphere □ Controlled temperature □ Room temperature

10. In addition to your firm, how many firms were involved in the collaboration?

Report your answer in numbers

_ _

11. Is/was there a considerable difference in size (annual turnover) between the partners?

□ Yes □ No □ I Don't know

12. Considering all the firms in the collaboration, how would you rank your company in terms of size? (ONLY ANSWER THIS QUESTION IF ANSWER IS "YES" FOR QUESTION 10)

Give a score from 1 (Smallest) to 7 (largest).

1	2	3	4	5	6	7

13. In which country(ies) are your partners located?

_ _

14. In this collaboration, the partner(s) are/were:

Cross the appropriate answer(s).

□ Jointly purchasing products

□ Jointly transporting products (either in the procurement or the distribution phase)

□ Jointly storing products (either in the procurement or the distribution phase)

□ Jointly manufacturing products (can include sharing production capacity, joint product design, and joint production processes)

15. In this collaboration, the partners are/were:

Cross the appropriate answer.

□ Servicing similar products to the same market segment

□ Servicing similar products to a different market segment

□ Servicing different products to the same market segments

□ Servicing different products to different market segments

16. How likely is it that your partner develops similar products to yours in the near future? (ONLY ANSWER THIS QUESTION IF ANSWERS 3 OR 4 ARE CHOSEN FOR QUESTION 15)

Give a score from 1 (very unlikely) to 7 (very likely).

1	2	3	4	5	6	7

17. Who was responsible about managing the collaboration?

Cross the appropriate answer.

□ Joint team composed of employees from all/some of the partners;
□ One firm from the collaborating partners;
□ An external entity (e.g. logistics service provider);
□ Other_ _ _ _

PART 2: COLLABORATION OPERATIONAL ASPECTS

We would like to know to what extent you agree with the following statements regarding the operational actions that are performed by the partners in the collaboration. Please answer the next questions based on the actual state of the collaboration (or last known if collaboration is over). Your answers should report your own opinion regarding all partners' actions in the relationship.

20. Information sharing

In this collaboration, the partners:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Share information on a regular basis	1	2	3	4	5	6	7
Share all information required for joint decision making	1	2	3	4	5	6	7
Share correct information for joint decision making	1	2	3	4	5	6	7
Share any type of information likely to help the partner(s)	1	2	3	4	5	6	7
Do not expect that each party informs the others about any change that is likely to affect them	1	2	3	4	5	6	7

21. Joint collaboration efforts

In this collaboration, the partners:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Have joint teams	1	2	3	4	5	6	7
Do not share clear common objectives	1	2	3	4	5	6	7
Conduct joint planning to anticipate and resolve operational problems	1	2	3	4	5	6	7
Make joint decisions about ways to implement operational activities	1	2	3	4	5	6	7
Perform regular joint measurement of performance	1	2	3	4	5	6	7
Have agreed on an acceptable cost/benefits allocation mechanism	1	2	3	4	5	6	7

22. Resource sharing

In this collaboration, the partners:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Have dedicated their own workforce to manage the collaboration	1	2	3	4	5	6	7
Are not ready to share their workforce for the benefits of the collaboration	1	2	3	4	5	6	7
Have shared assets that are beneficial for the collaboration (e.g. facilities, trucks, …)	1	2	3	4	5	6	7

23. Dedicated investments

In this collaboration, the partners:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Have invested substantially in personnel dedicated to this relationship	1	2	3	4	5	6	7
Have provided proprietary expertise and/or technology to this relationship	1	2	3	4	5	6	7
Have made significant dedicated investments in assets (e.g., facilities, trucks, …)	1	2	3	4	5	6	7

24. Partner's similarity

In this collaboration, the partners:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Have similar internal business processes (e.g. purchasing process, hiring process, ...)	1	2	3	4	5	6	7
Manage products that require similar logistics handling equipment (e.g. palettes, trucks, racks, ...)	1	2	3	4	5	6	7
Manage products that require similar transportation and storage conditions (e.g. temperature, humidity, ...)	1	2	3	4	5	6	7

PART 3: COLLABORATION RELATIONAL ASPECTS

We would like to know to what extent you agree with the following statements regarding relational aspects of your collaboration experience. Please answer the next questions based on the actual state of the collaboration (or last known if collaboration is over). Your answers should report your own opinion regarding the relationship.

25. Commitment

In this collaboration, my firm:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Expects the collaboration to continue for a long time	1	2	3	4	5	6	7
Believes in the long-term profitability of the relationship	1	2	3	4	5	6	7
Expects the collaboration to strengthen over time	1	2	3	4	5	6	7
Is not willing to make the necessary efforts for the collaboration to continue	1	2	3	4	5	6	7

26. Trust

In this collaboration, my firm believes the partner(s):	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Are qualified to fulfil their obligations	1	2	3	4	5	6	7
Are capable of performing their job	1	2	3	4	5	6	7
Have the skills to increase the collaboration performance	1	2	3	4	5	6	7
Are genuinely concerned about each other's success	1	2	3	4	5	6	7
Do not Keep each other's best interest in mind	1	2	3	4	5	6	7
Consider each other's welfare as well as their own	1	2	3	4	5	6	7
Do not have sound principles and values that guide their behaviour	1	2	3	4	5	6	7

27. Dependence

In this collaboration, my firm:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Depends on the partner(s) to achieve the desired objectives	1	2	3	4	5	6	7
Depends on the partner(s) to improve its performance	1	2	3	4	5	6	7
Has several alternatives to replace a partner in case of an exit	1	2	3	4	5	6	7
Believes that a partner's exit would result in a performance decline	1	2	3	4	5	6	7

PART 4: SATISFACTION WITH THE COLLABORATION

We would like to know to what extent you agree with the following statements regarding the outcomes of your collaboration experience compared to your expectations. Please answer the next questions based on the actual state of the collaboration (or last known if collaboration is over).

28. Satisfaction with relationship

My firm is satisfied with this collaboration in terms of:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Coordination of activities	1	2	3	4	5	6	7
Its participation in decision making	1	2	3	4	5	6	7
Level of commitment of the partners	1	2	3	4	5	6	7
Overall management of the collaboration	1	2	3	4	5	6	7

29. Satisfaction with result

My firm is satisfied with this collaboration in terms of:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
The level of costs reduction	1	2	3	4	5	6	7
The Increase in profit/turnover (growth)	1	2	3	4	5	6	7
The attained innovation level	1	2	3	4	5	6	7
The improved responsiveness to market changes	1	2	3	4	5	6	7
The reduction in environmental impacts	1	2	3	4	5	6	7

30. Overall satisfaction

Overall, my firm is satisfied with:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
The operational results	1	2	3	4	5	6	7
The quality of the relationship with the partner(s)	1	2	3	4	5	6	7
The collaboration experience as a whole	1	2	3	4	5	6	7

***Please answer the following questions based on your preferences for a potential* collaboration experience.**

31. On which collaboration activity(ies) would you be willing to collaborate:

Cross the appropriate answer(s).

□ Joint purchasing products
□ Joint transportation of products (either in the procurement or the distribution phase)
□ Joint storage of products (either in the procurement or the distribution phase)
□ Joint manufacturing of products (can include sharing production capacity, joint product design, and joint production processes)

32. Considering the nature of your potential partners, would you be willing to collaborate with:

Cross the appropriate answer(s).

□ Servicing similar products to the same market segment
□ Servicing similar products to a different market segment
□ Servicing different products to the same market segments
□ Servicing different products to different market segments

33. What is/are your preference(s) regarding the way collaboration is managed?

Cross the appropriate answer(s).

□ Collaboration is managed by a joint team composed of employees from all the partners;
□ Collaboration is managed by one firm among the partners;
□ Collaboration is managed by an external entity (e.g. logistics service provider);
□ Other (Please specify):_ _

34. What objectives are likely to motivate you to start collaborating?

Please divide 100 points across the objectives (the more points you give to an objective the more important it is).

Objective	Score
Cost reduction	
Growth	
Innovation	
Responsiveness improvement to market changes	
Environmental impact reduction	
Total	**100**

35. What would be your preferred scope of the collaboration?

Cross the appropriate answer(s)

□ Operational (execution of operational activities)

□ Tactical (joint planning, servicing markets together and sharing resources)

□ Strategic (joint learning, joint development of innovative concepts, and joint investments)

36. How important would size similarity (in terms of annual turnover) between the partners be in your decision to engage in a collaboration?

Give a score from 1 (Not important) to 7 (very important).

1	2	3	4	5	6	7

**** You will now go through 3 blocks of questions measuring various aspects of the collaboration at the operational and relational level, and finally about your overall evaluation with the collaboration. You will be asked to give a score from 1 (STRONGLY DISAGREE) to 7 (STRONGLY AGREE), knowing that the higher the score the more you agree with a statement. A score of 4 corresponds to a neutral position.***

PART 2: COLLABORATION OPERATIONAL ASPECTS

We would like to know to what extent you agree with the following statements regarding the operational actions that are performed by the partners in a collaboration.

37. Information sharing

When collaborating, you believe that you and your partner(s) should:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Exchange information on a regular basis	1	2	3	4	5	6	7
Share all information required for joint decision making	1	2	3	4	5	6	7
Exchange correct information for joint decision making	1	2	3	4	5	6	7
Share any type of information likely to help the partner(s)	1	2	3	4	5	6	7
Not inform each other about any change that is likely to affect them	1	2	3	4	5	6	7

38. Joint collaboration efforts

When collaborating, you believe that you and your partner(s) should:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Create joint teams composed of employees from all the partners	1	2	3	4	5	6	7
Have diverging objectives for the collaboration	1	2	3	4	5	6	7
Conduct joint planning to anticipate and resolve operational problems	1	2	3	4	5	6	7
Make joint decisions about ways to implement operational activities	1	2	3	4	5	6	7
Regularly measure joint performance	1	2	3	4	5	6	7
Not necessarily agree on an acceptable cost/benefits allocation mechanism	1	2	3	4	5	6	7

39. Resource sharing

When collaborating, you believe that you and your partner(s) should:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Dedicate your own workforce to manage the collaboration	1	2	3	4	5	6	7
Not Share your workforce for the benefits of the collaboration	1	2	3	4	5	6	7
Share any assets that are beneficial for the collaboration (e.g. facilities, trucks, …)	1	2	3	4	5	6	7

40. Dedicated investments

When collaborating, you believe that you and your partner(s) should:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Invest substantially in personnel dedicated to the relationship	1	2	3	4	5	6	7
Provide proprietary expertise and/or technology to each other	1	2	3	4	5	6	7
Invest substantially in assets dedicated to the relationship (e.g. facilities, trucks, ...)	1	2	3	4	5	6	7

41. Partner's similarity

When collaborating, it is important that you and your partner(s):	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Have similar internal business processes (e.g. purchasing process, hiring process, …)	1	2	3	4	5	6	7
Manage products that require similar logistics handling equipment (palettes, trucks, racks, …)	1	2	3	4	5	6	7
Manage products that require similar transportation and storage conditions (temperature, humidity, …)	1	2	3	4	5	6	7

PART 3: COLLABORATION RELATIONAL ASPECTS

We would like to know to what extent you agree with the following statements regarding collaboration relational aspects. Your answers should report your own opinion regarding the relationship.

42. Commitment

When collaborating, you believe that you and your partner(s) should:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Expects the collaboration to continue for a long time	1	2	3	4	5	6	7
Believe in the long-term profitability of the relationship	1	2	3	4	5	6	7
Expects the collaboration to strengthen over time	1	2	3	4	5	6	7
Not be willing to make the necessary efforts for the collaboration to continue	1	2	3	4	5	6	7

43. Trust

When collaborating, you believe that your partner(s) should:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Be qualified to fulfil their obligations	1	2	3	4	5	6	7
Be capable of performing their job	1	2	3	4	5	6	7
Have the skills to increase the collaboration performance	1	2	3	4	5	6	7
Be genuinely concerned about your success	1	2	3	4	5	6	7
Not keep your best interest in mind	1	2	3	4	5	6	7
Consider your welfare as well as their own	1	2	3	4	5	6	7
Not necessarily have sound principles and values that guide their behaviour	1	2	3	4	5	6	7

44. Dependence

When collaborating, you believe that you and your partner(s) would:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Depend on each other to achieve the desired objectives	1	2	3	4	5	6	7
Depend on each other to improve your respective performances	1	2	3	4	5	6	7
Have several alternatives to replace a partner in case of an exit	1	2	3	4	5	6	7
Incur a performance decline in case of a partner's exit	1	2	3	4	5	6	7

PART 4: SATISFACTION WITH THE COLLABORATION

We would like to know to what extent you agree with the following statements regarding different element likely to influence your satisfaction with collaboration.

45. Satisfaction with relationship

My satisfaction with the collaboration's relational aspects would depend on:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
My participation level in the coordination of activities	1	2	3	4	5	6	7
My participation level in decision making	1	2	3	4	5	6	7
My partners commitment level	1	2	3	4	5	6	7
The overall management of the collaboration	1	2	3	4	5	6	7

46. Satisfaction with result

My satisfaction with the collaboration's operational aspects would depend on:	**Strongly Disagree**			**Neutral**			**Strongly Agree**
The level of costs reduction	1	2	3	4	5	6	7
The Increase in profit/turnover (growth)	1	2	3	4	5	6	7
The attained innovation level	1	2	3	4	5	6	7
The improved responsiveness to market changes	1	2	3	4	5	6	7
The reduction in environmental impacts	1	2	3	4	5	6	7

Appendix 3. Delphi study questionnaire

Phase 1: Brainstorming

- **Question 1:** list at least 6 reasons you think can explain the difference in terms of joint relationship efforts between the expectations of non-collaborating industry professionals and the opinions of collaborating ones.
- **Question 2:** list at least 6 reasons you think can explain the difference in terms of trust between the expectations of non-collaborating industry professional and the opinions of collaborating ones.

Phase 2: Narrowing down

- **Question 1:** From the aggregate list of items resulting from phase 1, choose at least 10 items which you believe are the most important elements limiting joint relationship efforts.
- **Question 2** From the aggregate list of items resulting from phase 1, choose at least 10 items which you believe are the most important elements limiting trust development in collaboration.

Phase 3: Ranking

- **Question 1:** Rank the following elements, from most important to least important, in terms of their limiting impact on joint relationship efforts.
- **Question 2:** Rank the following elements, from most important to least important, in terms of their limiting impact on Trust development.

Appendix 4. Analysis of the measurement model output

Table A4-1: Complete list of items loadings

Items	Nfood		Food		LMLI		UMHI	
	P(>|z|)	Loading	P(>|z|)	Loading	P(>|z|)	Loading	P(>|z|)	Loading
INFOSHARE								
is1		0.613		0.67		0.63		0.648
is2	0	0.825	0	0.78	0	0.796	0	0.839
is3	0	0.847	0	0.851	0	0.842	0	0.866
is4	0	0.66	0	0.828	0	0.759	0	0.695
is5	0	0.348	0.003	0.278	0	0.31	0	0.322
JOINTRE								
jre1		0.737		0.66		0.686		0.773
jre2	0.001	0.238	0.087	0.162	0.001	0.194	0.067	0.203
jre3	0	0.869	0	0.865	0	0.854	0	0.882
jre4	0	0.866	0	0.8	0	0.831	0	0.944
jre5	0	0.326	0	0.604	0	0.461	0	0.412
jre6	0.011	0.184	0.004	0.273	0	0.229	0	0.214
DEDINVEST								
dedinv1		0.666		0.93		0.721		0.901
dedinv2	0	0.797	0	0.757	0	0.759	0	0.799
dedinv3	0	0.657	0	0.763	0	0.675	0	0.755
RESSHARE								
rs1		0.92		0.958		0.941		0.894
rs2	0	0.902	0	0.9	0	0.918	0	0.847
rs3	0	0.671	0	0.736	0	0.73	0	0.631
PARTSIMILAR								
ps1		0.534		0.504		0.505		0.522
ps2	0	0.861	0	0.885	0	0.892	0	0.946
ps3	0	0.791	0	0.848	0	0.774	0	0.792
COMMITMENT								
com1		0.847		0.88		0.887		0.796
com2	0	0.903	0	0.94	0	0.898	0	0.95
com3	0	0.761	0	0.817	0	0.777	0	0.849
TRUST								
tr1		0.857		0.809		0.795		0.924
tr2	0	0.876	0	0.821	0	0.784	0	0.944
tr3	0	0.697	0	0.78	0	0.723	0	0.787
tr4	0	0.404	0	0.686	0	0.517	0	0.535
tr5	0	0.278	0.001	0.306	0	0.273	0	0.283
tr6	0	0.304	0	0.593	0	0.434	0	0.395
tr7	0.113	0.114	0.004	0.263	0.001	0.185	0.031	0.201
DEPENDENCE								
dep1		0.935		0.934		0.926		0.95
dep2	0	0.836	0	0.656	0	0.771	0	0.73
dep3	0.218	0.088	0.997	0	0.318	0.057	0.318	0.057
dep4	0	0.672	0	0.75	0	0.69	0	0.756
SATISREL								
satrel1		0.614		0.692		0.618		0.707
satrel2	0	0.765	0	0.789	0	0.743	0	0.81
satrel3	0	0.736	0	0.833	0	0.764	0	0.896
satrel4	0	0.734	0	0.843	0	0.809	0	0.773
SATISRES								
satres1		0.493		0.603		0.538		0.551
satres2	0	0.634	0	0.668	0	0.639	0	0.676
satres3	0	0.774	0	0.708	0	0.728	0	0.804
satres4	0	0.71	0	0.825	0	0.737	0	0.789
satres5	0	0.705	0	0.656	0	0.684	0	0.658

Table A4-2: Squared correlations matrix for the food sample

	IS	JRE	DI	RS	PS	COM	TR	DEP	SRL	SRS
IS	1									
JRE	0.25	1								
DI	0.04	0.11	1							
RS	0.00	0.15	0.27	1						
PS	0.05	0.00	0.01	0.00	1					
COM	0.14	0.03	0.08	0.04	0.09	1				
TR	0.12	0.18	0.03	0.02	0.09	0.28	1			
DEP	0.02	0.00	0.10	0.01	0.01	0.11	0.01	1		
SRL	0.20	0.11	0.07	0.02	0.05	0.20	0.33	0.03	1	
SRS	0.17	0.05	0.04	0.02	0.04	0.12	0.32	0.08	0.61	1
AVE	**0.68**	**0.62**	**0.67**	**0.76**	**0.58**	**0.78**	**0.69**	**0.62**	**0.68**	**0.56**

Table A4-3: squared correlation matrix for the non-food sample

	IS	JRE	DI	RS	PS	COM	TR	DEP	SRL	SRS
IS	1									
JRE	0.10	1								
DI	0.01	0.01	1							
RS	0.02	0.01	0.19	1						
PS	0.00	0.03	0.13	0.14	1					
COM	0.07	0.10	0.06	0.13	0.01	1				
TR	0.12	0.13	0.00	0.03	0.00	0.23	1			
DEP	0.02	0.01	0.02	0.01	0.00	0.01	0.01	1		
SRL	0.12	0.10	0.08	0.03	0.01	0.17	0.35	0.06	1	
SRS	0.05	0.02	0.15	0.02	0.08	0.06	0.12	0.00	0.35	1
AVE	**0.62**	**0.68**	**0.50**	**0.70**	**0.55**	**0.70**	**0.72**	**0.67**	**0.55**	**0.57**

Table A4-4: Squared correlations matrix for the LMLI sample

	IS	JRE	DI	RS	PS	COM	TR	DEP	SRL	SRS
IS	1									
JRE	0.27	1								
DI	0.10	0.18	1							
RS	0.02	0.07	0.24	1						
PS	0.04	0.03	0.12	0.06	1					
COM	0.13	0.09	0.11	0.09	0.04	1				
TR	0.15	0.15	0.07	0.03	0.02	0.20	1			
DEP	0.00	0.02	0.04	0.00	0.00	0.00	0.01	1		
SRL	0.16	0.12	0.13	0.03	0.04	0.21	0.37	0.01	1	
SRS	0.12	0.06	0.12	0.03	0.06	0.08	0.20	0.00	0.42	1
AVE	**0.65**	**0.62**	**0.52**	**0.75**	**0.55**	**0.73**	**0.63**	**0.64**	**0.59**	**0.54**

Table A4-5: Squared correlations matrix for the LMLI sample

	IS	JRE	DI	RS	PS	COM	TR	DEP	SRL	SRS
IS	1									
JRE	0.0037	1								
DI	0.0001	0.0068	1							
RS	0.0014	0.0170	0.2294	1						
PS	0.0109	0.0002	0.0001	0.0031	1					
COM	0.0309	0.0140	0.0096	0.0927	0.0003	1				
TR	0.0853	0.0999	0.0260	0.0105	0.0014	0.3696	1			
DEP	0.0065	0.0038	0.0574	0.0258	0.0021	0.0274	0.0004	1		
SRL	0.1046	0.0499	0.0083	0.0067	0.0005	0.1085	0.1556	0.0005	1	
SRS	0.0492	0.0059	0.1103	0.0001	0.0013	0.0743	0.1196	0.0380	0.5212	1
AVE	**0.65**	**0.77**	**0.67**	**0.64**	**0.60**	**0.75**	**0.78**	**0.67**	**0.70**	**0.61**

IS: Information sharing; JRE: Joint relationship efforts; DI: Dedicated investments; RE: Resource sharing; PS: Partners similarity; COM: Commitment; TR: Trust; DEP: Dependence; SRL: Satisfaction with the relationship; SRS: Satisfaction with the results

Table A4-6: Common method bias analysis with common latent factor

Items	Model without common latent factor	Model with common latent factor	Differences
INFOSHARE			
is2	0.774	0.761	0.013
is3	0.908	0.914	0.006
is4	0.716	0.699	0.017
JOINTRE			
jre1	0.697	0.692	0.005
jre3	0.882	0.88	0.002
jre4	0.836	0.839	0.003
DEDINVEST			
dedinv1	0.772	0.753	0.019
dedinv2	0.767	0.745	0.022
dedinv3	0.695	0.738	0.043
RESSHARE			
rs1	0.937	0.863	0.074
rs2	0.898	0.825	0.073
rs3	0.698	0.761	0.063
PARTSIMILAR			
ps1	0.513	0.487	0.026
ps2	0.898	0.909	0.011
ps3	0.784	0.764	0.02
COMMITMENT			
com1	0.856	0.846	0.01
com2	0.912	0.895	0.017
com3	0.779	0.777	0.002
TRUST			
tr1	0.868	0.867	0.001
tr2	0.887	0.878	0.009
tr3	0.695	0.705	0.01
DEPENDENCE			
dep1	0.936	0.895	0.041
dep2	0.768	0.72	0.048
dep4	0.694	0.7	0.006
SATISREL			
satrel2	0.731	0.718	0.013
satrel3	0.803	0.802	0.001
satrel4	0.81	0.798	0.012
SATISRES			
satres3	0.765	0.669	0.096
satres4	0.76	0.688	0.072
satres5	0.719	0.688	0.031

Appendix 5. Partial structural invariance output

Table A5-1: Partial invariance analysis results (Food vs Non-Food samples)

Constrained regression paths	Df	X^2	ΔX^2	ΔDf	Pr(>X^2)	Different?
Unconstrained model	804	1 207.99	n/a	n/a	n/a	n/a
DEDINVEST → DEPENDENCE	805	1 208.72	0.74	1	0.39	Not Different
DEPENDENCE → COMMITMENT	805	1 213.36	5.38	1	0.02	Different
INFOSHARE → COMMITMENT	805	1 208.99	1.01	1	0.32	Not Different
JOINTRE → COMMITMENT	805	1 212.70	4.71	1	0.03	Different
RESSHARE →COMMITMENT	805	1 209.63	1.65	1	0.20	Not Different
DEDINVEST → COMMITMENT	805	1 208.05	0.07	1	0.79	Not Different
TRUST → COMMITMENT	805	1 208.72	0.74	1	0.39	Not Different
INFOSHARE →TRUST	805	1 209.59	1.61	1	0.20	Not Different
JOINTRE → TRUST	805	1 208.08	0.09	1	0.76	Not Different
RESSHARE → TRUST	805	1 209.07	1.08	1	0.30	Not Different
DEDINVEST → TRUST	805	1 208.79	0.81	1	0.37	Not Different
PARTSIMILAR → JOINTRE	805	1 208.12	0.14	1	0.71	Not Different
COMMITMENT → SATISREL	805	1 208.60	0.61	1	0.43	Not Different
TRUST→ SATISREL	805	1 209.32	1.33	1	0.25	Not Different
COMMITMENT → SATISRES	805	1 207.99	0	1	1.00	Not Different
TRUST →SATISRES	805	1 210.93	2.94	1	0.09	Not Different

Table A5-2: Partial invariance analysis results (LMLI vs UMHI samples)

Constrained regression paths	Df	X^2	ΔX^2	ΔDf	Pr(>X^2)	Different?
Unconstrained model	804	1 245.25	n/a	n/a	n/a	n/a
DEDINVEST → DEPENDENCE	805	1 245.28	0.03	1	0.86	Not Different
DEPENDENCE → COMMITMENT	805	1 245.62	0.38	1	0.54	Not Different
INFOSHARE → COMMITMENT	805	1 247.32	2.08	1	0.15	Not Different
JOINTRE → COMMITMENT	805	1 245.56	0.31	1	0.58	Not Different
RESSHARE →COMMITMENT	805	1 245.42	0.17	1	0.68	Not Different
DEDINVEST → COMMITMENT	805	1 245.33	0.09	1	0.77	Not Different
TRUST → COMMITMENT	805	1 249.70	4.46	1	0.03	Different
INFOSHARE →TRUST	805	1 245.40	0.16	1	0.69	Not Different
JOINTRE → TRUST	805	1 245.45	0.21	1	0.65	Not Different
RESSHARE → TRUST	805	1 245.94	0.69	1	0.41	Not Different
DEDINVEST → TRUST	805	1 248.04	2.79	1	0.09	Not Different
PARTSIMILAR → JOINTRE	805	1 246.53	1.28	1	0.26	Not Different
COMMITMENT → SATISREL	805	1 245.49	0.25	1	0.62	Not Different
TRUST→ SATISREL	805	1 245.67	0.42	1	0.52	Not Different
COMMITMENT → SATISRES	805	1 245.25	0.00	1	0.96	Not Different
TRUST →SATISRES	805	1 245.37	0.13	1	0.72	Not Different

Appendix 6. SEM multi-group analysis including control variables

Structural invariance is investigated for all samples while accounting for possible confounding from company size and respondent title. Concerning the food and non-food samples, we first ran a structural model with unconstrained regression paths, while keeping the equality constraints found in the measurement part, i.e. loading and intercepts (Model 1). As shown in the Table A6-1, this model fits the data well. Second, we constrain the regression paths between the covariates and the latent factors to be equal across groups and keeping the regression paths between the latent factors unconstrained (Model 2). The results of this model show that it fits the data well. In comparison to the previous SEM model, ΔRMSEA and ΔCFI are acceptable (<0.001) and the difference. Third, in addition to the equality constraints in the second model, we further constrain the regression paths between the latent factors to be equal (Model 3). The results show that the model had a good fit, but the difference in the X^2 value in significant, meaning that full structural invariance is not achieved. As such, we further investigate for differences between the two samples by testing each path separately. To do so, we compared Model 2 with SEM models where each single regression path between the latent factors is constrained to be equal at a time using the likelihood ratio test. The results show that two structural paths are noninvariant across the two industry samples (*Dependence → Commitment and Joint relationship efforts → Commitment*. Considering this result, we re-ran the SEM multigroup analysis with the invariant paths constrained to be equal and noninvariant paths left as free parameters (Model 4). The resulting model also fits the data well.

A similar analysis is conducted on the LMLI and UMHI samples. The table below shows that the unconstrained structural model (Model 5) fits the data well. The model where only the covariate regression paths are constrained to be equal (Model 6) also shows a good model fit and results in acceptable changes in CFI and RMSEA (<0.01). The fully constrained model (Model 7) also shows a good fit and results in acceptable changes in CFI and RMSEA (<0.01). Although the results suggest that full structural invariance is achieved, we decided to further investigate the existence of differences between the groups through testing each regression path separately. Thus, we compared Model 6 with models where each single regression path is constrained to be equal at a time. The results show that one regression path is identified as noninvariant (Trust → Commitment). Considering this result, we re-ran the

SEM multigroup analysis with the invariant paths constrained to be equal and noninvariant path left as free parameters (Model 8). The resulting model also fits the data well.

Table A6-1: Structural invariance test results while controlling for size

Invariance tests	X^2 (df)	CFI	RMSEA	NNFI	ΔCFI	ΔRMSEA
SEM models for the Food and Non-Food samples						
Model 1 - Unconstrained structural model (free regression paths)	1720,28 (1188)	0.901	0.051	0.887	n/a	n/a
Model 2 - Model with equal covariate regression paths	1775,24 (1236)	0.899	0.050	0.890	0.002	0.001
Model 3 - Model with full structural invariance (equal regression path for covariates and latent variables)	1892.3 (1252) *	0.897	0.051	0.889	0.002	0.001
Model 4 - Partial Structural invariance model	1791.29 (1250)	0.899	0.050	0.891	0.002	0.001
SEM models for the LMLI and UMHI samples						
Model 5 - Unconstrained structural model (free regression paths)	1729,41 (1188)	0.899	0.051	0.886	n/a	n/a
Model 6 - Model with equal covariate regression paths	1786,38 (1236)	0.898	0.051	0.888	0.001	0.000
Model 7 - Model with full structural invariance (equal regression path for covariates and latent variables)	1799.17 (1252)	0.898	0.050	0.890	0.000	0.001
Model 8 - Partial Structural invariance model	1791.29 (1251)	0.899	0.050	0.891	0.001	0.000

Summary

This thesis focuses on the concept of Horizontal Logistics Collaboration (HLC), which represents the situation where two or more companies, operating at the same supply chain level, decide to work together on logistics activities to improve their respective performances. In the recent years, HLC has been presented as an innovative strategy to improve the economic and environmental efficiency of the logistics sector through flow consolidation and to help companies achieve a competitive advantage by having access to resources outside their boundaries. Despite their theoretical and practical popularity, many horizontal collaboration relationships fail to reach the desired objectives. While many theoretical contributions have focused on understanding divers of horizontal collaboration, the literature on HLC has paid little or no attention to (i) defining HLC types, (ii) investigating the context influence, and (iii) examining the reasons behind the limited number of successful horizontal collaboration experiences. Hence, the overall objective of this thesis is to unveil the underlying dynamics of HLC by investigating the following research objectives:

- RO1: Develop a typology of horizontal logistics collaboration concepts;
- RO2a: Identify supporting and constraining factors influencing HLC in AFSCs in Morocco;
- RO2b: Examine industry and country contexts effect on the factors influencing HLC;
- RO3: Examine the similarities and differences between industry professionals' intentions towards collaboration and their actual behaviour (a) and identify which collaboration barriers limit collaborative behaviour (b).

This thesis draws on several economic and behavioural theories and uses both case-based and survey-based methods in a complementary way to answer the above questions and increase our understanding of HLC.

The first research objective (RO), which is to develop a typology of horizontal logistics collaboration concepts, is investigated in *Chapter 2*. In this chapter, the horizontal logistics collaboration concept (HLCC) is introduced, which includes (i) developing a typology of HLC, identifying the HLC enablers and what their implications are on the logistics system,

(iii) categorizing context factors that have a potential influence on HLC, and finally (iv) identifying adequate performance indicators to assess the collaboration outcomes. A review of interfirm collaboration literature resulted in the identification of four dimensions to typify HLC, namely the collaboration activities (e.g. transportation, procurement), nature (competitive vs non-competitive), structure (tight vs loose, and formal vs informal), and intensity (high vs low). A collaboration type represents a combination of elements from each dimension, which choice is influenced by the collaboration operational and relational enablers.

RO2a, which targets the identification of factors influencing the outcomes of HLC in agri-food supply chains (AFSCs) in Morocco, is investigated in *Chapter 3*. This chapter presents a conceptual model for HLC, linking collaborative activities to the collaboration outcomes through the mediation of relational constructs while considering the specific characteristics of AFSCs. The model is then tested via two case studies from the agri-food sector in Morocco. The results support the premise that collaborative activities such as *information sharing* and *joint relationship efforts* influence partners *satisfaction with the relationship* and *with the results*, through the mediation of *dependence*, *trust*, and *commitment*. The results also indicate that AFSCs characteristics increase the importance of *partners similarity*, which in turn facilitate joint relationship efforts. Finally, the cases country-specific characteristics which influence the trust level in the relationship, such as the prior interpersonal relationships, shared value, and the level of uncertainty avoidance.

RO2b, which consist of examining the industry and country contexts effect of the factors influencing HLC outcomes, is presented in *Chapter 4*. Using structural equations modelling, hypotheses developed based on the model presented in Chapter 3 are tested using data collected from developing and developed countries, as well as in- and outside the agri-food industry. The results indicate that the model is supported by samples from different industry and country categories, providing a strong basis for its generalizability. However, few differences emerge when comparing structural results across samples. In terms of industry context effect, the effect of dependence on commitment was only significant in the food sample, creating an indirect effect of dedicated investments on commitment. This difference is traced back to the fact that AFSCs rely on highly specialized and expensive technical equipment, for which a high utilization rate is necessary and can be obtained through horizontal collaboration. Country context wise, the effect of trust on commitment was found

to be significantly stronger in high-income countries compared to the low-income countries, which is linked to the weak institutional context and the low trust levels exhibited outside family structures in low-income countries.

RO3, which intends to (i) study the similarities and differences between industry professionals' expectations and opinion regarding Horizontal Logistics Collaboration and (ii) identify which collaboration barriers limit collaborative behaviour, is presented in *Chapter 5*. In this chapter, a comparative study is first conducted to investigate differences between expectation of non-collaborating professionals and the reality of collaboration experiences. The results show that collaborating professionals engage in less joint relationship efforts and exhibit lower trust levels towards their partners than expected. Examining the reasons behind these differences reveal the existence of structural and socio-cultural barriers that limit collaborative behaviour. These barriers are primarily associated with inadequate information sharing, poor collaboration formalization, and the absence of cost/benefits allocation mechanisms.

In chapter 6, we present the conclusions and general discussion. An integrated model of HLC is presented that combines the findings from chapters 2, 3, 4 and 5. Furthermore, the practical implications for industry professionals and the overall theoretical contributions of the thesis are presented. Summarising the main conclusions, this thesis provides new insights into (i) the different types of HLC and the operational implications in terms of the HLC scenario (partners selection, resource sharing, information exchange, process integration, organization structure), (ii) the omnipresent country and industry context effect on the different factors influencing the collaboration outcomes, and (iii) the structural and socio-cultural barriers that interfere between the industry professionals' intentions and their behaviour with regards to HLC success factors. The thesis concludes with discussing the limitations of this research and presents a number of research opportunities that can further support the success of HLC in practice.

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Publications in this thesis

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Badraoui, I., van der Vorst, J.G.A.J, Boulaksil, Y (2019). Horizontal Logistics Collaboration: an exploratory study in Morocco's agri-food supply chains. *International Journal of Logistics Research and Applications, DOI: 10.1080/13675567.2019.1604646*

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Badraoui, I., van der Lans, I., Boulaksil, Y., van der Vorst, J.G.A.J. Intentions versus Actual Actions in Horizontal Logistics Collaboration. *Submitted to an international scientific journal*

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Completed Training and Supervision Plan

Wageningen School of Social Sciences

Name of the learning activity	Department/Institute	Year	ECTS*
A) Project related competencies			
Operations Research and Logistics, ORL 30806	WUR	2015	2
Introduction to Structural Equations Modelling	Utrecht University	2016	1.5
Quantitative Data Analysis: Multivariate Techniques, YRM 50806	WUR	2017	6
Questionnaire Construction, YRM 65300	WUR	2017	1.5
Food Value Chain Research	WASS	2017	1.5
Statistical Programming with R	Utrecht University	2018	1.5
B) General research related competences			
WASS Introduction course	WASS	2015	1
Proposal Writing	WUR	2015	6
Data Management Planning	WGS	2016	0.4
The Essentials of Scientific Writing and Presenting	WGS	2018	1.2
Food Legumes Consumption in Morocco: 'Understanding Moroccan consumers' behaviour' and Improving local products competitiveness through regional valorisation centers'	International Conference on Pulses, Marrakesh, Morocco	2016	1
'Sustainable Food Value Chains', 'Horizontal Collaboration for agri-food value chains' and 'Wheat Value Chain in Morocco'	Training, ICARDA Tunis, Tunisia	2017	1
'Wheat Value chain In Morocco: A global Picture'	Workshop on sustainable intensification of wheat in northern Africa, ICARDA Rabat, Morocco	2017	1
'Enabling Horizontal Logistics Collaboration in agri-food supply chains in developing countries'	Scientific days of the 13th International Exhibition of Agriculture', Meknes, Morocco	2018	1

C) Career related competences/personal development

Reviewing a Scientific Paper	WGS/WUR	2016	0.1
Scientific paper review	International Journal of Logistics Research and Application	2017	1
Mobilising your Scientific Network	WGS/WUR	2018	1
Lecturer in Operations Management & Logistics courses and Supervision of thesis and internship students with projects on Operations Management & Logistics	International University of Rabat	2015-2019	4
Total			**32.7**

*One credit according to ECTS is on average equivalent to 28 hours of study load

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